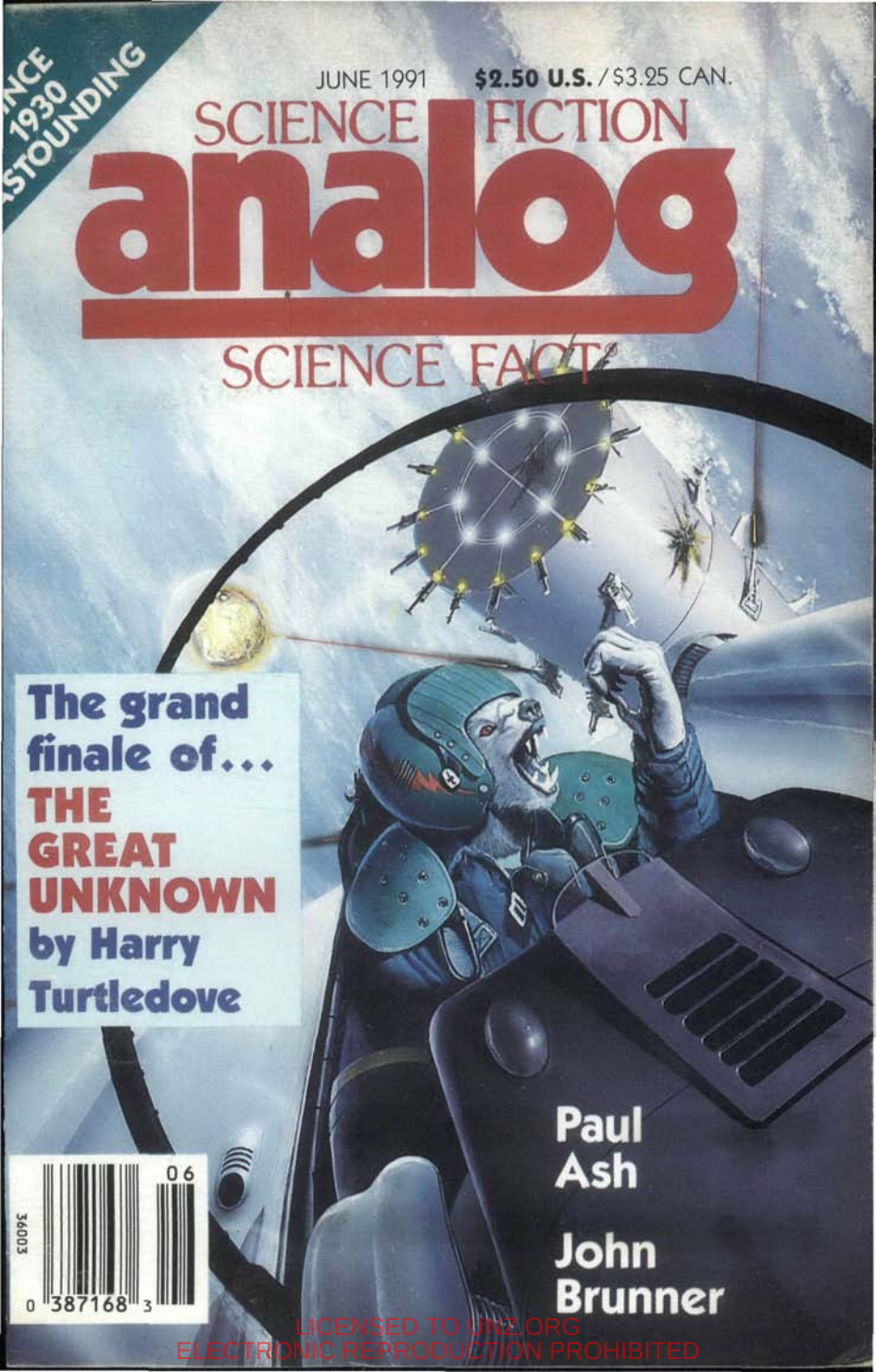
JUNE 1991 $2.50 U.S. / $3.25 CAN.

NCE 1930
STOUNDING

SCIENCE FICTION analog SCIENCE FACT



The grand finale of...
THE GREAT UNKNOWN
by Harry Turtledove

Paul Ash

John Brunner

06
36003
0 387168 3

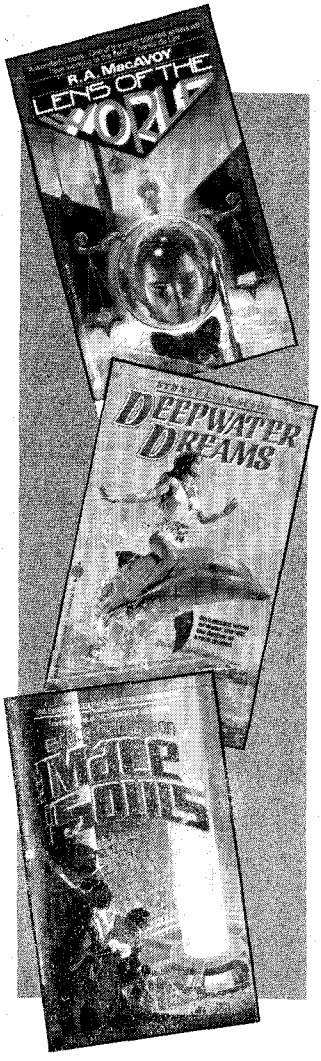
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ELECTRONIC REPRODUCTION PROHIBITED
LICENSED TO ONZ.ORG

Will there be any victor when humans and aliens alike are caught up in a war far older than either race?
REDEMPTION OF LIGHT
By KATHLEEN M. O'NEAL
Best-selling author of PEOPLE OF THE FIRE
In this concluding volume of an epic science fiction trilogy, the alien Magistrates are determined to destroy all that remains of the human Gamant civilization, while Jeremiel Baruch, leader of the Underground's fleet, launches his forces on a last desperate campaign against the enemy. What neither side knows is that they are all about to be engulfed in the final stages of a conflict that began before either the Magistrates or the Gamants existed, a conflict which, before it is over, will sweep across all of time and space...
$4.99
DAW Books, Inc.
Distributed by Penguin USA

AVON BOOKS

THE FINEST IN FANTASY AND SCIENCE FICTION



LENS OF THE WORLD
R.A. MacAvoy

Volume One in a remarkable new trilogy from the award-winning author of *Tea With the Black Dragon, The Book of Kells,* and the Damiano series.

"Sheer entertainment...The art of storytelling at its best."
—Orson Scott Card, *Fantasy and Science Fiction*

"Skillfully plays with some of the best-known conventions of heroic fantasy."
—*San Francisco Chronicle*

"MacAvoy has just about every skill of the accomplished fantasist at her command... [This] series may eventually rank with Donaldson's Thomas Covenant series, Wolfe's Latro and Card's Alvin Maker sagas." —Roland Green, *Booklist*

DEEPWATER DREAMS
Sydney J. Van Scyoc

In the compelling style of Ursula K. LeGuin and Joan Slonczewski, Sydney J. Van Scyoc builds a detailed picture of an altered human society in conflict with itself.

THE MACE OF SOULS
Bruce Fergusson

Bruce Fergusson, author of the highly praised *The Shadow of his Wings,* returns to the panoramic Six Kingdoms to weave an extraordinary story of a wily hero who goes on a quest to recover his lover's lost soul.

"One expects excellence, and Fergusson delivers." —*Fantasy Review*

"Gritty high fantasy...A novel that swallows the reader up—right until the last page is turned, and then some."
—Charles deLint, *Other Realms*

Coming in June 1991

AVON BOOKS The Hearst Corporation

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

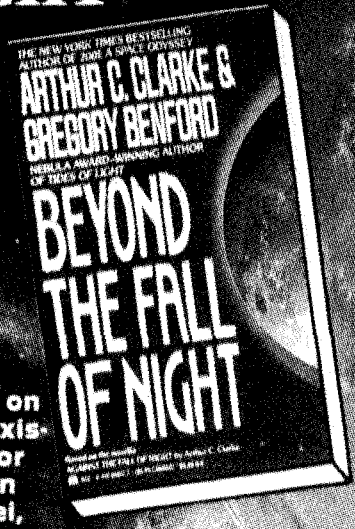
Arthur C. Clarke's

critically acclaimed novella,
Against the Fall of Night,
expanded and continued by

Gregory Benford

BEYOND THE FALL OF NIGHT

"Fascinating..."
-The New York Times


THE NEW YORK TIMES BESTSELLING AUTHOR OF 2001: A SPACE ODYSSEY
ARTHUR C. CLARKE & GREGORY BENFORD
NEBULA AWARD-WINNING AUTHOR OF TIDES OF LIGHT
BEYOND THE FALL OF NIGHT

Diaspar is the last living city on Earth. The only humans in existence have stagnated there for eons, their lives dependent on machines. But Alvin of Loronei, the first child born in 4,000 years, refuses to accept barriers. Breaking away, he comes face to face with the evil forces that created Diaspar. And after a fierce confrontation with the outside world, he forces his people to conquer their fears—and reach for their destiny among the stars.

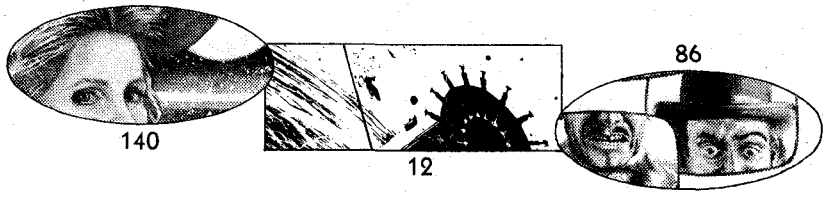
$4.95

MAP

ACE
SCIENCE FICTION & FANTASY

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

analog



Vol. CXI No. 7
June 1991

Next issue on sale
May 28, 1991

Serial

THE GREAT UNKNOWN, (Conclusion), Harry Turtledove ____ 12

Novella

MAN OPENING A DOOR, Paul Ash ____ 140

Novelettes

ADA WILKINS ON-LINE DURING DOWN TIME, John Brunner ____ 86
DEFECT?, F. Alexander Brejcha ____ 108

Science Fact

ISLANDS IN THE SKY: HUMAN EXPLORATION
AND SETTLEMENT OF THE OORT CLOUD, Richard P. Terra ____ 68

Short Story

STINKER STATION, Scott Sandford ____ 124

Probability Zero

UNCERTAINTY EXCHANGE, David J. Strumfels ____ 105

Reader's Departments

THE EDITOR'S PAGE ____ 4
IN TIMES TO COME ____ 134
THE ALTERNATE VIEW, John G. Cramer ____ 135
THE REFERENCE LIBRARY, Tom Easton ____ 178
BRASS TACKS ____ 186
THE ANALOG CALENDAR OF UPCOMING EVENTS ____ 192

Cover by Nicholas Jainschigg

Joel Davis
President

A. Bruce Chatterton
Publisher

Stanley Schmidt
Editor

Tina Lee
Managing Editor

Terri Czeczko
Art Director

Indicia on Page 6

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Editorial

THE SELF-CLOGGING ESCAPE VALVE

Stanley Schmidt

A few months back (in "Say When!," February 1991) I considered the problem of how to decide when human population should be considered "excessive" and what, if anything, should be done in such a case. In that column I took pointed issue with a reader who had what seemed to me a rather "Scroogish" attitude toward the question. Despite my objections to some of his ideas about what he and others might reasonably do, I agreed with his basic contention that overpopulation was a far more fundamental problem than details like what kind of bags people use to carry groceries. I elaborated on that belief in another column ("Missing Ingredient," December 1990)—which, quite predictably, led to another deluge of mail agreeing or disagreeing (usually vehemently) with various points I made. And that deluge provided my inspiration for today.

What I found most surprising in those letters was that a good many people, including some scientists and engineers, apparently still cling to beliefs which make their holders feel good, but which I fear just don't bear scrutiny. One reader wanted to know what Thomas Malthus, in his view long since discredited, was doing in the otherwise enlightened pages of *Analog*. He accused me of ignoring the potentials of space travel and nanotechnology, which

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

he apparently thought would eliminate all problems of excessive crowding and consumption. Another shrugged off concern for the size or density of population *per se,* asserting flatly that family size is of "no consequence" as long as that population is well educated and careful in managing its environment. Another admonished me to "look to the stars," and concentrate on solutions rather than problems, again citing things like fusion power and the possibility of moving into space.

It all sounded fine and stirring; I have often used many of these phrases, or others like them, myself. But I also recognize that finding good solutions usually involves first understanding the problems as well as possible. It involves having a reasonably realistic idea of your own limitations; and while it's true that humans can do a great deal more than they often realize to solve any particular problem, they *cannot* do anything and everything just because they'd like to. As far as I know, we all remain subject to fundamental physical laws. We may not have the last word on what the true limits are, but neither do we have any reason to suppose that there aren't any.

The two major fallacies that disturbed me in some of these letters can be summed up as follows:

(1) That technology (and in particular nanotechnology) can do whatever is needed to accommodate essentially any population in a fixed location such as Earth.

(2) That space travel will make population control unnecessary by providing new resources and a place for excess population to go.

What's wrong with these comforting views can be capsulized with comparable succinctness, but *understanding* what's wrong with them is important enough to warrant a bit more space.

Let's take number **(1)** first. The fact is that *any* given technology and resource base can only support so many people at any given standard of living. To some extent you can increase the standard of living and/or the sustainable number (never forgetting that there's a built-in trade-off between those two variables) by improving your technology or expanding your resource base. Nanotechnology does hold out the promise of astonishing improvements in what can be done with given supplies of material and energy, and space travel offers similar increases in those supplies. But in neither case is the potential increase *infinite*. One of the very serious concerns of people actively examining our progress toward nanotechnology is that far too many people simply do not grasp that distinction. From our present rather primitive perspective, the things that can reasonably be expected of nanotechnology look so much like magic that people tend to think that they *are* magic and have no bounds.

The people actually working in the field know better. The new limits are way beyond the ones we're used to, but they are limits nonetheless. Exponential growth will still not take long (in historic terms) to reach them. The reader who rebuked me for sounding like Malthus, with his (so far) incorrect predic-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tion that population growth would outrun food production, invoked the name of K. Eric Drexler, the best-known spokesman for nanotechnology. I responded by quoting Drexler himself, in a passage from *Engines of Creation* that this reader had apparently overlooked or forgotten:

> "Was Malthus wrong? Not fundamentally; he was wrong chiefly about timing and details. Growth on Earth does face limits, since Earth has limited room, whether for farming or anything else. Malthus failed to predict when limits would pinch us chiefly because he failed to anticipate breakthroughs in farm equipment, crop genetics, and fertilizers.
>
> "Some people now note that exponential growth will overrun the fixed stock of Earth's resources, a simpler argument than the one Malthus made. Though space technology will break this limit, it will not break all limits. Even if the universe were infinitely large, we still could

STANLEY SCHMIDT ..... Editor
TINA LEE ..... Managing Editor
IAN RANDAL STROCK ..... Assistant Editor
SCOTT L. TOWNER ..... Editorial Assistant
A. BRUCE CHATTERTON ..... Publisher
TERRI CZECZKO ..... Art Director
ANTHONY BARI ..... Junior Designer
CAROLE DIXON ..... Production Director
CYNTHIA MANSON ..... Director of Marketing and Subsidiary Rights
CONSTANCE SCARBOROUGH . Contracts Manager
VEENA RAGHAVAN ..... Director, Special Projects
CHRISTIAN DORBANDT ..... Newsstand Marketing and Promotion Manager
DENNIS JONES ..... Newsstand Operations Manager
ELIZABETH BEATTY ..... Circulation Director
PHYLLIS JESSEN ..... Circulation Planning Director
JUDY DORMAN ..... Advertising Coordinator
IRENE BOZOKI ..... Classified Advertising Director
BARBARA ZINKHEN ...Classified Advertising Manager

Published since 1930

JOEL DAVIS
President

CARL BARTEE
Vice President
Manufacturing

JOE De FALCO
Vice President
Finance

MARY TZIMOKAS
Vice President
Circulation

First issue of *Astounding* January 1930

ADVERTISING OFFICES
NEW YORK
(212) 557-9100

MPA

Analog Science Fiction/Science Fact (Astounding) is published every 28 days which includes special issues in January and July by Davis Publications, Inc. at $2.50 a copy in U.S.A., $3.25 in Canada. 1 year subscription for $34.95 in the U.S.A. and possessions, in all other countries, $40.50 (GST included in Canada, GST #R123993128) payable in advance in U.S. funds. First copy of new subscription will be mailed within eight weeks of receipt of order. When reporting change of address allow 6 to 8 weeks and give new address as well as the old address as it appears on the last label. Second-class postage paid at New York, NY, and at additional mailing office. Canadian 3rd class postage paid at Windsor, Ontario.

© 1991 by Davis Publications, Inc., all rights reserved. Protection secured under the Universal Copyright Convention. Reproduction or use of editorial or pictorial content in any manner without express permission is prohibited. All stories in this magazine are fiction. No actual persons are designated by name or character. Any similarity is coincidental. Printed in U.S.A. All submissions must be accompanied by stamped self-addressed envelope, the publisher assumes no responsibility for unsolicited manuscripts or artwork.

POSTMASTER: SEND to ANALOG SCIENCE FICTION/SCIENCE FACT (ASTOUNDING) P.O. BOX 7061, Red Oak, IA 51591. IN CANADA RETURN TO 1801 SOUTH CAMERON, WINDSOR, ONT. CANADA N9B 3E1
Editorial and Advertising: Analog Science Fiction/Science Fact, 380 Lexington Avenue, New York, NY 10168-0035
Subscriptions: Analog Science Fiction/Science Fact, P.O. Box 7061, Red Oak, IA 51591.ISSN 0161-9398

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

DICKENS VIDEOS BY MAIL
1-800-228-4246

JAPANIMATION

Robotech Macross Saga Vol. 1-6	$79.95 set
Vol. I - Vol. 6	$14.95 ea.
Gunbusters Vol. I	$34.95
Dangaio Vol. 1	$34.95
Madox 01	$34.95
Astro Boy Vols. 1 -4	$24.95 ea.
Gigantor Vol. 1-2	$19.95 ea.
AKIRA	$29.95 ea.
AKIRA-Production Report	$29.95 ea.
Zillion Vols. 1-3	$14.95 ea.
Robotech Next Generation (Mospeda) Vol. I	$24.95 ea.
Speed Racer:	
Desperate Racer	$9.95
Car with Brain	$9.95
Great Car Wrestling Match	$9.95
Race for Revenge	$14.95
The Trick Race	$9.95
Challenge of the Masked Racer	$14.95

To order call 1-800-228-4246 or send check or money order including $3.00 per tape or $6.00 per set shipping/handling to:

DICKENS VIDEOS BY MAIL
5323-A ELKHORN BLVD.
SACRAMENTO, CA 95842

Questions call 1-916-331-8370 VHS only. PAL transfers available. Catalogs $4.95 or free with order. CA residents add 6.5 % sales tax.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

not travel infinitely fast. The laws of nature will limit the rate of growth: Earth's life will spread no faster than light.

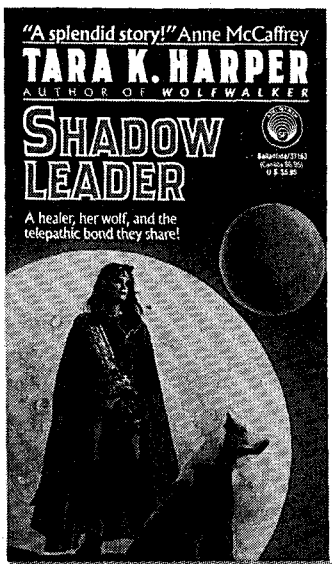
"Steady expansion will open new resources at a rate that will increase as the frontier spreads deeper and wider into space. This will result not in linear growth, but in cubic growth. Yet Malthus was essentially right: exponential growth will outrun cubic growth as easily as it would linear. Calculations show that unchecked population growth, with or without long life, would overrun available resources in about one or two thousand years at most. Unlimited exponential growth remains a fantasy, even in space."

Yes, it's *conceivable* that this argument, too, may turn out to rest on false assumptions and need later revision. I can imagine, for example, that the structure of the Universe may turn out to be different from what it now seems—much as the version we know differs from the one Newton knew—so that the speed of light limitation will turn out not to be as rigid as most physicists now think. But I have no reason to *expect* that to happen. One reader chided me for my lack of "faith" in science, engineering, and the future; but *blind* faith in these things is hardly a solid basis for action. To blithely keep expanding population, always assuming technology can keep up, is reckless. Far better to have the needed technology available *before* expanding to a degree that will require it. To do otherwise is like spending money you have only vague hopes of someday earning. (I realize that plenty of people do that, but it's not a *smart* thing to do.)

How about my alleged fallacy number **(2)**—space as an escape valve and/or cornucopia? Assuming that the Solar System, Galaxy, or Universe will provide infinite resources and/or space neglects the crucial fact that colonists will need and want both for themselves. They will use resources, so they won't be shipping them all back to Earth. The longer they're out there, the more distant Earth will come to seem, and the less inclined colonists will be to send it most of what they produce. Surely Americans, whose ancestors went through the same process after migrating here from Europe, must understand and anticipate this. Furthermore, colonists will expand to fill whatever living space they're sent into, without any help from additional emigrants from Earth. Even if we could ship people off Earth as fast as they were born, whatever expansion space we could ship them into would fill even faster, because people there will be reproducing too—also exponentially, if nothing is done to prevent it.

The idea that we *could* ship people off Earth as fast as they were born is itself farfetched. As of 1987, the annual rate of population growth for the whole Earth was about 87 million per year—and growing. That's about 240,000 per day. If you could build a fleet of ships capable of carrying 500 passengers each to new homes somewhere in space, keeping Earth's population steady that way would require almost 500 launches per day, every day. Think about the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED


"A splendid story!" Anne McCaffrey
TARA K. HARPER
AUTHOR OF WOLFWALKER
SHADOW LEADER
A healer, her wolf, and the telepathic bond they share!

The stunning sequel to the bestselling *Wolfwalker*!

"A SPLENDID STORY!"

—Anne McCaffrey

Linked by an unbreakable telepathic bond, Dion and her wolf, Gray Hishn, had led their companions on a desperate flight to warn their people of impending war. Now, though their unique healing talents had saved many lives, their own lives were threatened by a deadly enemy...

DEL REY **#1 in Science Fiction and Fantasy**
Published by Ballantine Books

On Sale in May

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

energy requirements of each such launch, to say nothing of the logistics of getting the passengers to the spaceport, and into the aforementioned new housing. Now think about the logistics of *building* housing in space for a quarter of a million new people per day, *even with* nanotechnology in its most optimistic form. If you think you can handle all the technological problems, do you think you can find that many people who *want* to leave Earth? If so, who will pay their way? If not, will you pick some and *force* them to go?

Do you *really* believe that space and nanotechnology will make it unnecessary to control population growth, here or anywhere else?

Actually, that last suggestion, about *forcing* people to leave, might easily become disturbingly popular—though in practice, cheaper, uglier methods of getting rid of them might become even more so. One reason we have come to place such a high value on human life is that through most of history it has been both scarce and fragile. History has shown repeatedly that when any commodity becomes too abundant, it tends to become devalued. I see no reason to assume that can't happen to human life, too. If the population of any place becomes too dense, I can easily imagine individual human lives coming to be viewed as cheap, even disposable. That will tend to alleviate the pressure, of course—but is that really *how* we want to do it? I hope those who advocate unlimited population growth will consider the question very carefully before answering.

It is a tempting and therefore common fallacy to picture exporting population to space as like bleeding gas through an escape valve. The problem is that exported people don't act like a real gas (which is conserved), but like a gas that keeps creating more gas as it expands. As long as you allow it to do that without limit, *no* escape valve or bigger container will be adequate to control the pressure indefinitely. Sooner or later, the population pressure in every container will have to be controlled from within, rather than assuming that any excess can easily be bled off. ■

Customer Service or Subscriber Assistance
Please direct all changes of address
and subscription questions to:
Analog Science Fiction / Science Fact
P.O. Box 7061
Red Oak, IA 51591

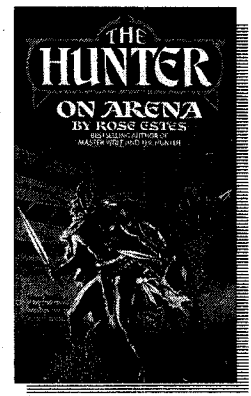
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

N E W S F R O M

Questar
SCIENCE FICTION FANTASY

THE HUNT FOR FREEDOM CONTINUES!

The bestselling author of the *Greyhawk Adventures* series delivers the second installment in her thrilling *Hunter* trilogy.



Once Braldt the Hunter was a warrior lord of his Ice Age tribe. Now, abducted from his planet, he is a gladiatorial slave, forced to fight interspecies death duels for the amusement of unseen Masters on the planet Arena. Together with four other interplanetary aliens, Braldt is forced into combat and weapons training, then offered the chance to "provide yourself with glory and rewards for the greater enjoyment of the Masters." To escape, Braldt needs answers, and he can gain information from his captors only if he and his teammates win their battles against hideous alien monsters. Again and again, Braldt leads his team to victory, and finally closer to freedom...

Cover art by Clyde Caldwell
0-446-36136-4/$4.95
(In Canada: $5.95)

Also read:
The Hunter
0-445-20970-4/$4.95
(In Canada: $5.95)

A WORD FROM BRIAN THOMSEN

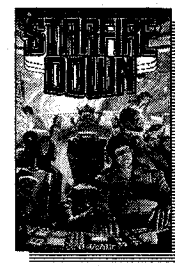
There are certain duos that work so well together that one might suspect that they were predestined. Kirk Douglas and Tony Curtis in *Spartacus*, C3PO and R2D2 in *Star Wars*, Fafhrd and Mouser, and who can forget Questar's own Conek and Cge.

Science Fiction and Fantasy is another perfect team-up, the first the extrapolation of science, the second the fictional fabrication of the imagination. Together, a wonder to behold... and in case you've been wondering, next month we bring back some old Friends, so when you see me around I'll send you their best.

ALSO THIS MONTH:

STARFIRE DOWN

by Lee McKeone



The heroes of the bestselling *Ghoster* and *Backblast* are back in an exciting new interplanetary adventure!

Ex-smuggler Conek and his miswired droid sidekick Cge are trying to go straight—but it isn't easy! In STARFIRE DOWN, Conek's pretty teen pilot, Gella, is wrongfully sentenced to death by alien maniacs. Meanwhile, her missing ship holds a hideous cargo with the power to blow up an entire star system. Conek finds himself becoming both sleuth and spy to save her, the ship...and himself!

Cover art by James Warhola
0-446-36137-2/$4.95
(In Canada: $5.95)

Also read:
Ghoster
0-445-20620-9/$3.50
(In Canada: $4.50)

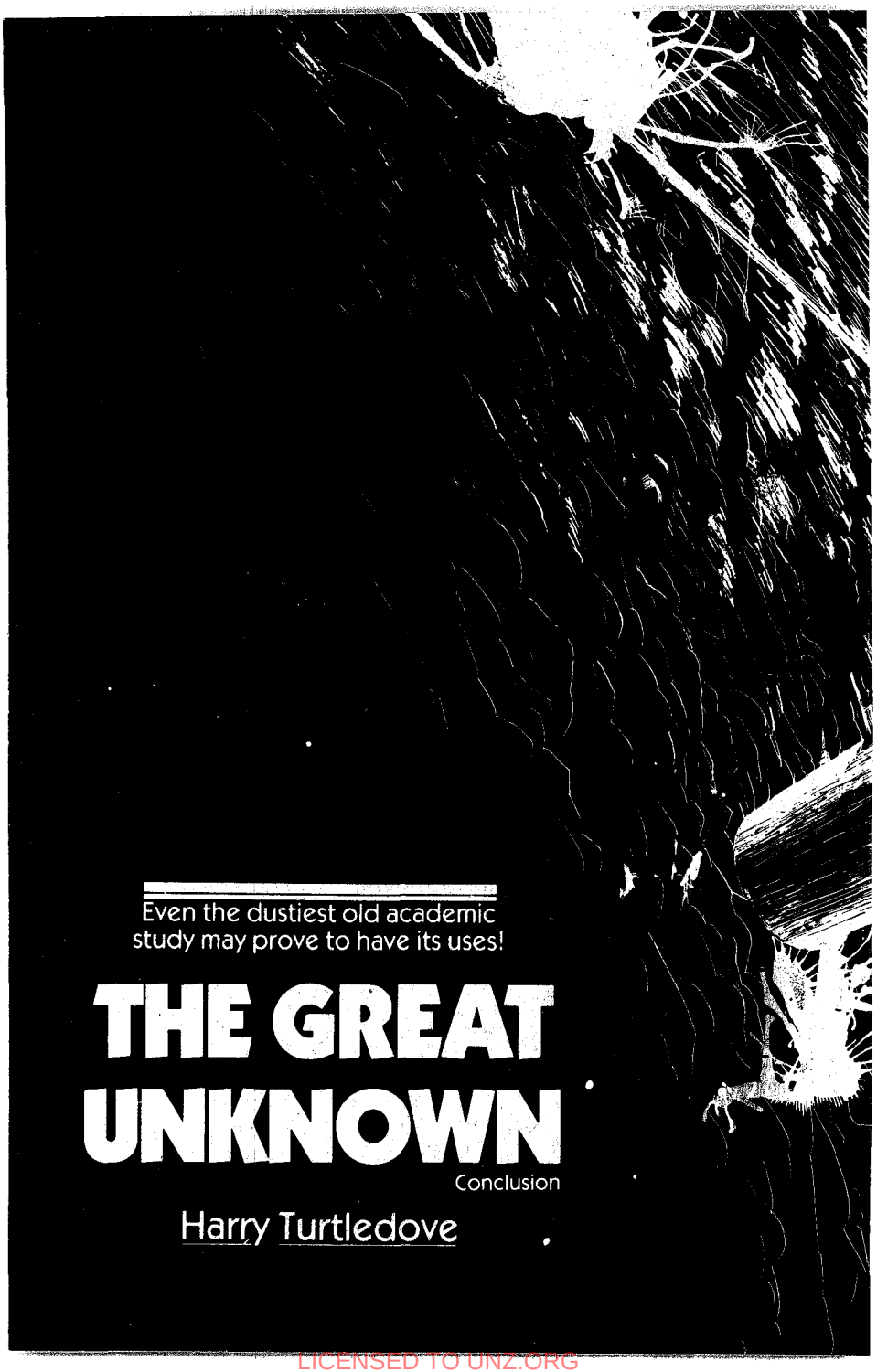
Backblast
0-445-20622-5/$3.95
(In Canada: $4.95)

AVAILABLE AT BOOKSTORES EVERYWHERE

WARNER BOOKS

© 1995 Warner Books Inc. Questar is a registered trademark of Warner Books, Inc.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



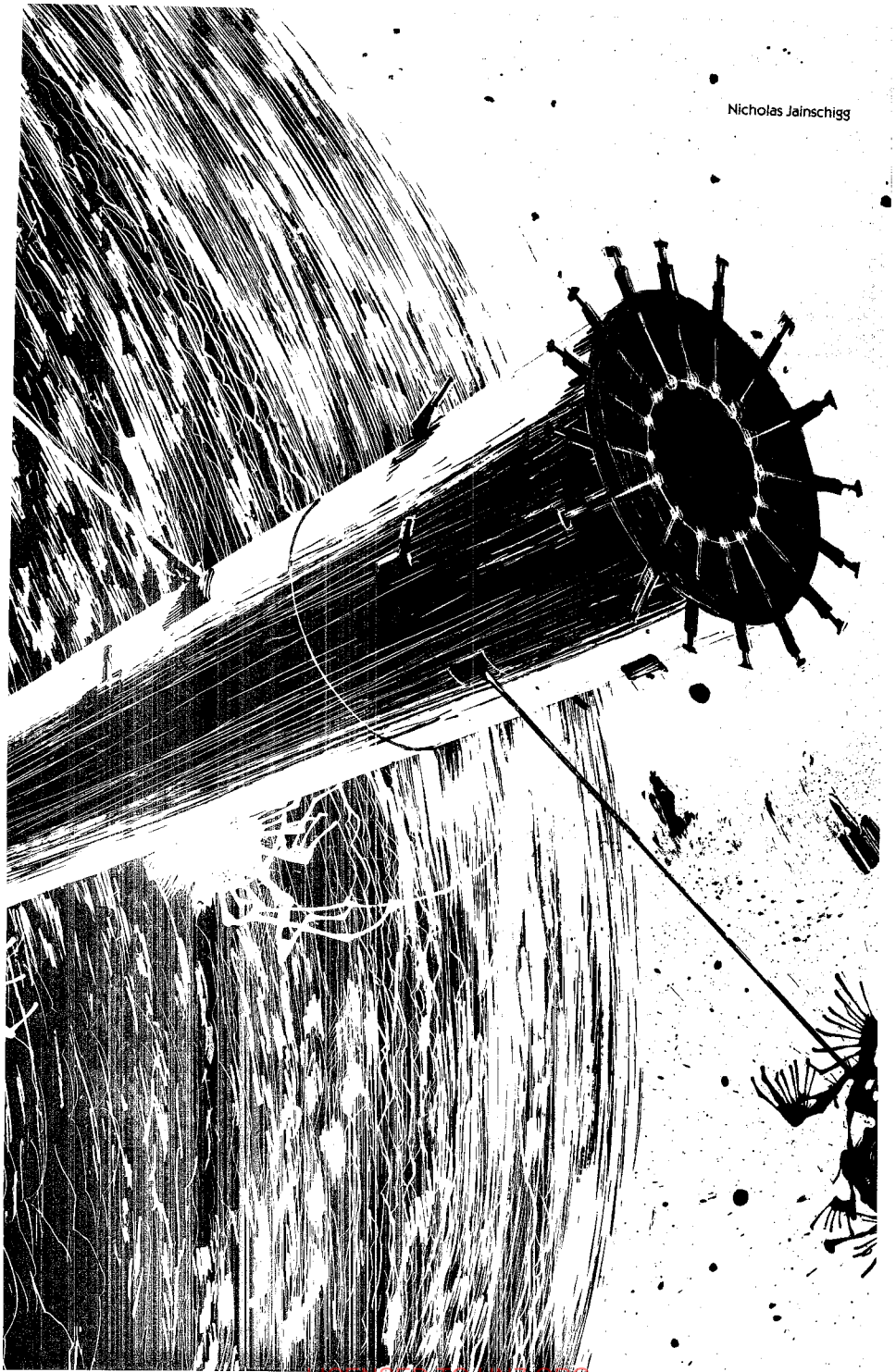
Even the dustiest old academic study may prove to have its uses!

THE GREAT UNKNOWN

Conclusion

Harry Turtledove

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

SUMMARY

After several years as a trader, **Jennifer Logan** *had finally gotten just what she'd always wanted: a post teaching Middle English science fiction at Saugus Central University. When she started her third semester there, though, she got a surprise: she discovered that three* **Foitani** *were enrolled in her course. The Foitani had been a great race once, but 28,000 or so years before had almost exterminated themselves in a series of conflicts they called the* **Suicide Wars.** *Only now were some of the planets where they survived emerging from the barbarism into which the wars had cast them. Jennifer was wild with curiosity as to why the large, blue, rather fierce-looking aliens were interested in ancient literature, but she could not bring herself to ask; the Foitani themselves volunteered nothing.*

When she tried to explain her excitement to her boyfriend, **Ali Bakhtiar,** *she ran into a stone wall—he was more interested in watching battleball on the holovid. His complete indifference sparked a fight that led to her moving out; she arranged to stay with her friend* **Ella Metchnikova** *until she could get an apartment of her own.*

*The Foitani—***Thegun Thegun Nug, Aissur Aissur Rus,** *and* **Dargnil Dargnil Lin***—proved to be good students, whatever their motivations. They still revealed little of themselves, though Dargnil Dargnil Lin showed an almost religious faith in the abilities of the* **Great Ones***: the Foitani who had lived before the Suicide Wars.*

One night just before Jennifer was going to move into her new apartment, Ella had her lover come over. Jennifer decided to spend the evening in her office, which boasted a couch on which she could—she hoped—sleep. Ali Bakhtiar and Ella called her one after the other to let her know the Foitani were looking for her. A little later, they found her, and asked, or rather told, her to come with them. When she refused, Thegun Thegun Nug stunned her.

She woke up on a Foitani starship. The food, water, and sanitary setup aboard said ship were minimal—a bit less than minimal, as she was female. Thegun Thegun Nug informed her that she had been hired at journeyman trader's wages on the recommendation of another human. She could not imagine who had recommended her to the Foitani, or why, but she did not think kind thoughts about that person.

Aissur Aissur Rus explained that the Foitani of his planet, Odern, were interested in regaining the level of civilization the Great Ones had achieved, and that she could somehow help in that process. Just how remained obscure until the starship landed on Odern. There she learned who had suggested that the Foitani contact her: her old trading chief, **Bernard Greenberg.** *She grudgingly forgave him when she realized he hadn't intended that they kidnap her.*

She also learned from a Foitani official named **Pawasar Pawasar Ras** *that his people had found on the nearly dead world Gilver a monument they called the* **Great Unknown;** *it dated from the time of the Great Ones and infallibly drove Foitani mad. That made them curious and desperate enough to*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

seek help from another race, which was how Greenberg had gotten involved.

Jennifer took up residence aboard his ship, the Harold Meeker. *After a while, she and Greenberg, who had been occasional lovers in the past, resumed the relationship, not least because they were the only two humans within a thousand light-years.*

The Foitani ordered Greenberg and her to accompany them to Gilver in the Harold Meeker *to try to solve the riddle of the Great Unknown. On the way there, a hyperdrive trap from the time of the Great Ones pulled their ship and the Foitani vessel, the* Horzefalus Kwef, *back into normal space, where a missile would have destroyed it but for the Foitani. No human world knew how to make such a trap. It gave Jennifer a good deal to think about.*

A few days later, they emerged from hyperdrive near Gilver, only to find it under attack by Foitani from another surviving world, **Rof Golan**—*a different and more predatory race. Being on the paranoid side, the Foitani from Odern had installed a military base there even though they thought Gilver their secret. They drove back the Rof Golani and let the* Harold Meeker *and* Horzefalus Kwef *land safely. Jennifer and Greenberg emerged to join the Foitani scientific team studying the Great Unknown.*

A trip out to the structure gave no information save that it was indeed enormous and architecturally impressive. Jennifer suggested blowing a hole in it and going inside. Greenberg wondered if the aliens would think that was blasphemous. Jennifer didn't care. She took her case to Aissur Aissur Rus, who agreed and took the suggestion to Pawasar Pawasar Ras. He was unenthusiastic and worried about what the tower might contain, but finally went along. Jennifer also learned in the course of that conversation that Foitani were female for about the first thirty years of their lives, and male thereafter. The modern Foitani assumed the Great Ones had been the same.

The Foitani explosives expert, **Enfram Enfram Marf,** *was so violently xenophobic that Jennifer realized the Foitani she'd known before were really what passed for diplomats among their species. The thought worried her.*

Equipped with a suitable shaped charge, she and Greenberg headed for the Great Unknown again. As they were on their way, the Foitani from Rof Golan launched another attack on Gilver, this one including ground troops. Some of those ground troops pursued the two humans into the zone of insanity surrounding the Great Unknown. Then the gray-blue Foitani from Rof Golan, captured by the obsession that went with the structure, pounded past them and straight on toward the central tower. It was a long trip; the sledges that carried the humans repassed the worn out aliens a couple of kilometers before they got to the tower.

Jennifer and Greenberg set and exploded their shaped charge, which duly blew a large, round hole in the side of the tower—a large, round hole the Foitani from Odern found invisible from their base. The Foitani from Rof Golan couldn't sense it, either, when they got to the tower. They noticed the humans, though, as they were going inside the Great Unknown, and tried to catch

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

them. Jennifer and Greenberg dove through the hole just in time. From within the tower, they watched the Foitani try to reach in after them, and fail—for the aliens, the hole truly seemed not to exist.

Then the lights came on inside the chamber in which the humans had landed—and when they looked back at the hole, they found it had disappeared for them too. Jennifer felt where it had been. To her senses, it wasn't there any more.

They traveled down a hall to a chamber with an astonishingly real holovid or statue of a Great One. That was what Jennifer thought it was, at any rate, until it turned to look at her. She fired her stunner at it. It did not fall over, but did scratch, just as other Foitani had done under the influence of her weapon's beam. Then it came over, looked at them, sniffed them, and summoned up a number of what also seemed to be holovid images . . . until it came to a pair of primitive humans. Jennifer wondered if they were in some sort of living data storage zoo. The thought was chilling, but after the Great One turned out alive, all bets were off. She also wondered if the Great One knew he'd been inside the Great Unknown for 28,000 years. Then there was no more time for wondering—the Foitan seized a weapon of his own and herded the traders into a command post. There he got a glimpse of the fighting around the Great Unknown. That surprised—and horrified—him. He summoned several other Great Ones, all armed with weapons like his own. They went out through the hole the humans had blown in the Great Unknown, which their weapons reconstituted. Jennifer wished Pawasar Pawasar Ras had never listened to her.

Jennifer expected the befuddled Foitani from Rof Golan to worship the Great Ones. Instead, they rushed toward them, teeth bared and claws out; only one had the wit to remember his personal weapon. And the Great Ones methodically used their *weapons to massacre the Rof Golani, then proceeded to kick their corpses in absolute revulsion. The Great Ones also began shooting aircraft from both the Rof Golani and the Foitani from Odern out of the sky at distances that seemed impossible for hand weapons. Then they—and their human prisoners—advanced on the base of the Foitani from Odern. They massacred any Foitani they spotted on the way, and took one casualty themselves.*

The Foitani from Odern got on the radio to Jennifer and Greenberg, and ended up talking with the Great Ones, whom they seemed fully prepared to venerate. A delegation came out from the base the next morning, and started to do just that, until the wind shifted. When they caught the scent of the Great Ones, they blindly charged. Backed by the base's armaments, they massacred the Great Ones as savagely as the latter had treated the insane Rof Golani.

Pawasar Pawasar Ras ordered the two terrified humans into the base, not wanting them to come to harm because they stayed too close to the kwopillot from the Great Unknown. The translator program failed to translate the crucial word, but Jennifer and Greenberg went in anyway. Inside the command post, they found the Foitani from Odern willing, even eager to ally with the Rof Golani against the Great Ones, though

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

SCIENCE FICTION CONTINUUM

Catalogue of Science Fiction, Fantasy, and Horror

Television The Way It's Supposed To Be!

SPACE: 1999 ©ITC — $14.99 ea.

These are the first four releases of the popular SF series starring Martin Landau and Barbara Bain. Each tape contains one episode and is approximately 60 minutes long.

#1 VOYAGERS RETURN - Moonbase Alpha encounters Voyager One, but its malfunctioning drive threatens to destroy them.

#2 MATTER OF LIFE AND DEATH - Helenas lost husband mysteriously reappears and warns her to stay away from an anti-matter planet.

#3 EARTHBOUND - An alien spaceship, with its crew in suspended animation, lands on Moonbase Alpha on its way to Earth.

#4 THE GUARDIAN OF PIRI - Moonbase Alpha encounters the Planet Piri, where a machine was built so that everyone would have a perfect life.

DOCTOR WHO — $19.99 each

	Death to the Daleks
	The Five Doctors
	Pyramids of Mars
	Revenge of the Cybermen
	Robots of Death
	Seeds of Death
NEW! Ark In Space	NEW! Spearhead From Space
Brain Of Morbius	NEW! Terror of the Zygons
Day of the Daleks	NEW! Time Warrior
Deadly Assassin	Talons of Weng Chiang

PREMIERE EPISODES AND PILOTS

BATTLESTAR GALACTICA	$24.99
BUCK ROGERS 25TH CENTURY	$19.99
INCREDIBLE HULK	$19.99
LOST IN SPACE	$24.99
LOST IN SPACE (orig. unaired)	$24.99
PRISONER/ARRIVAL	$29.99
PRISONER UNAIRED EPISODE	$29.99

DARK SHADOWS

The following 30 min. tapes contain scence from the entire series. *$9.99 each!*

BEST OF DARK SHADOWS
BEST OF BARNABAS
SCARIEST MOMENTS OF DARK SHADOWS
THE 1840 FLASHBACK
MUSIC OF DARK SHADOWS

DARK SHADOWS - RESURRECTION OF BARNABAS - The first 5 episodes starting from Barnabas emerging from his tomb. $29.99

Sets are $69.99 each. Save $10 off the suggested retail.

#2-4 - Barnabas tries to recreate Josette in Maggie
#5-8 - Ghost of Sarah Collins appears
#9-12 - Julia Hoffman arrives at Collinwood
#13-16 - Julia tries to cure Barnabas
#17-20 - David becomes trapped in the mausoleum
#21-24 - Barnabas turns into a 175 year old man
#25-28 - Victoria disappears during a seance
#29-32 - Victoria is transported back to 1795
#33-36 - Barnabas becomes a vampire
#37-40 - Barnabas tries to make Josette a vampire
#41-44 - Victoria is tried as a witch
#45-48 - Victoria reappears in the 20th century
#49-52 - Roger marries Cassandra (Angelique)
#53-56 - The ghost of Rev Trask attacks Barnabas
#57-60 - Nickolas Blair arrives at Collinwood
#61-64 - Barnabas is a victim of the dream curse.
#65-68 - Angelique becomes a vampire
#69-72 - Adam asks Carolyn to marry him
#73-76 - Barnabas & Julia create Eve only to find they have reincarnated Danielle Roget (6/25)
#77-80 - Nicholas resurects vampire vampire Tom Jennings (7/25)
#81-84 - The ghosts of Quentin and Beth Chavez appear (8/25)

MPI HOME VIDEO

CALL TOLL-FREE TO ORDER - (800) 232-6002

VHS only. We accept Visa, Mastercard & American Express. Continental USA shipping charges - 1 tape - $4, 2 tapes - $6, $1.50 each add'l tape. Dark Shadows prepacks are $5 each shipping. We ship via UPS. HI, AK, PR, & Canada call for shipping charge. Canada call (908) 755-2331 to order. New Jersey Residents add 7% sales tax. Send $1 for a catalogue. Mail to: S & J Productions, Inc. P.O. Box 154 Colonia, N.J. 07067

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

they had been slaughtering each other until the Great Ones emerged. When the Rof Golani commander, **Vomisa W Nhoj,** *learned the Great Ones were* kwopillot, *he was eager to make an alliance, too.*

After a good deal of argument, the Foitani from Odern reluctantly (they were Victorian in their attitude toward sex) explained what kwopillot *were: Foitani who, through hormonal intervention in the egg, could be either male or female at birth, and kept their gender throughout life. The perversion was relatively easy to effect; degenerates had created* kwopillot *on a number of Foitani worlds.*

Jennifer and Greenberg, who knew most about the creatures who had emerged from the Great Unknown, were summoned to the command post to brief the Foitani from Odern and Vomisa W Nhoj on them, on their technology, and on their actions. In the middle of that briefing, a Foitan at a radar screen announced that the central tower of the Great Unknown had lifted off from the surface of Gilver and was performing as a spacecraft. "Please advise," he told Pawasar Pawasar Ras.

PART III

"A spacecraft?" Pawasar Pawasar Ras, Aissur Aissur Rus, and Vomisa W Nhoj said in the Foitani language, Jennifer and Greenberg in Spanglish.

Vomisa W Nhoj recovered first. He shouted in Foitani. "Shoot the foul-smelling thing down," the translator said. "Your ships and mine together, Oderna. We can kill each other any time we choose. The *kwopillot* will not wait."

"That is a reasonable assessment of the situation," Pawasar Pawasar Ras said after a moment's pause for thought. He spoke to the ceiling: "All ships from Odern are directed to destroy the spacecraft which has arisen from the Great Unknown. Warleader Vomisa W Nhoj instructs Rof Golani ships to cooperate in this effort."

"Missiles launching," the ceiling speaker reported.

Vomisa W Nhoj bared his teeth. "This is not a proper headquarters, Pawasar Pawasar Ras. If I cannot bite the foe in person, at least let me see how my fellows' fangs sink in."

"As you wish," Pawasar Pawasar Ras said after another pause. "I do not think you or your followers would be in a good position to betray us." He rapped on the wall behind him, hurried through the door he had called into being. Aissur Aissur Rus and his other aides followed. The Foitani from Rof Golan were right behind.

The Rof Golani did not bother making the doorway close after themselves. "Come on," Jennifer said to Greenberg. "If we follow them, we may get some idea of what's going on."

"We may get our heads bitten off, too—literally, if the Rof Golani have anything to say about it," he answered. All the same, he went after the Foitani. So did Jennifer.

They had to trot to catch up with the bigger aliens, and then to keep up with them. A couple of Rof Golani snarled at them, but otherwise let them alone. They hurried into the command post hard on Vomisa W Nhoj's heels.

The place had been chaotic enough before the Rof Golani came in. Foitani

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

from Odern ran here and there, shouted at one another and into headsets, pointed at screens and holovid radar plots. A couple of the dark blue Foitani turned in threatening fashion toward the gray-blue interlopers from Rof Golan. Pawasar Pawasar Ras said, "They have become our co-belligerents against the flying tower. Furnish Vomisa W Nhoj with communications gear, that he may command his spacecraft to cooperate with us against the common foe, for *kwopillot* cannot be other than the enemies of all proper Foitani."

One of the Foitani from Odern gave Vomisa W Nhoj a headset. He screamed into it. Watching one of the radar tanks, Jennifer saw red sparks begin to move in unison with blue ones as both colors converged on a bigger white point of light.

Greenberg was watching the tank, too. He said, "The Rof Golani came here intending to smash up Gilver. They ought to be able to blast that tower, no matter how big it is."

"Do we want them to?" Jennifer asked. "I know they say the old-time Foitani are evil and vicious, but as far as I can see, they're just acting the same way the modern ones do. And since when are aliens' sex lives any of our business?"

"I'd feel better about being neutral if we still had a way home in case the Great Ones wrecked the *Harold Meeker*," he answered. "As long as it's sitting outside this base, I'm for the Foitani from Odern and Rof Golan."

"Something to that," Jennifer had to admit.

She and Greenberg did their best to stay out from under foot as Foitani hurried this way and that. Jumping clear was all up to them, for the Foitani would not change directions for their sake. Jennifer wondered if that was because humans were too small for Foitani to bother noticing, or just because they were non-Foitani and therefore not worth dodging. Whichever way it was (she suspected the latter), she quickly learned to grow eyes in the back of her head to keep from getting trampled.

A Rof Golani ship abruptly vanished from the radar tank. Vomisa W Nhoj screamed something that the translator rendered as, "How extremely unfortunate." A good deal of juice seemed to have been squeezed out somewhere.

More ships started disappearing. No matter what sort of Foitani perverts crewed it, no matter that it had been grounded for 28,000 years, the ship that had been a tower was a formidable killing machine. Vomisa W Nhoj made noises suggesting a wild animal with a leg caught in a trap. Pawasar Pawasar Ras sounded calmer—that seemed the way on Odern—but no happier.

After a dismayingly short while, the course of the battle grew clear: the Great Ones were mopping up everything the modern Foitani could throw at them. Pawasar Pawasar Ras ordered one of his few surviving ships to break off and head back to Odern.

Vomisa W Nhoj yowled a phrase that sounded as if it would have made a pretty good operations order for the end of the world. "A cowardly act," the translator reported bloodlessly.

"By no means," Pawasar Pawasar Ras said. "Suppose we are defeated and destroyed here. That will leave the *kwopillot* free to rampage through the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Foitani sphere, with no one to know what they are until they come within smelling range. Our home worlds must be warned. What I do is wisdom. Deny it if you may.''

The Rof Golani warleader did not reply directly, but spoke into his headset. Before long, one of the red blips in the radar tank turned tail and boosted toward hyperdrive kick-in. Vomisa W Nhoj said no more about it. No Foitan Jennifer had ever seen was any good at admitting he was wrong.

''I just hope the Foitani sphere is all these revived Great Ones worry about for a while,'' Greenberg said. ''If they have records of humans, they know where Earth is.''

''They'd find out soon enough anyway, from dealing with the Foitani from Odern,'' Jennifer answered. It was not much consolation. One way or another, trouble was coming.

Trouble was, in fact, already here. The ship that had spent a geological epoch being a tower was still dreadfully efficient in its own role. Gallant to the end, the Foitani from Odern and Rof Golan kept attacking long after they must have known they were doomed. Back on Earth, a long time ago, tribesmen had shown insane courage by charging straight at machine-gun nests. But for making them end up dead in gruesomely large numbers, their courage hadn't got them anything. Similar bravery served the Foitani no better now.

''Attack from space imminent,'' Pawasar Pawasar Ras called. ''Prepare to resist to the end.''

Jennifer was certain the Foitani would do just that. She was also certain the end had become quite imminent. She squeezed Bernard Greenberg's hand, hard. ''I love you, too,'' she said. When the end comes, some words should not be left unspoken.

He hugged her. She hugged him, too. She did not care what the Foitani thought, not now. The only good thing she saw about being here was that the end would probably be quick. The Great Ones up there had overwhelming weapons and could hardly miss.

Vomisa W Nhoj said, ''Get me a hand-weapon, Oderna, that I may shoot at my slayers as they destroy me.''

Jennifer watched the tower/ship in the radar tank. It hung overhead, an outsized sword of Damocles. Suddenly one of the communications screens lit up. A green-blue Foitani face peered out of it: a Great One. A technician spoke to Pawasar Pawasar Ras: ''Honored kin-group leader, the, ah, Foitan Solut Mek Kem would address you.''

Jennifer's heart leaped. Surely one did not seek to address a person one was on the very point of destroying.

Pawasar Pawasar Ras saw things in a different light. He said, ''So you have called to gloat, have you, *kwopil*?'' Jennifer's hopes plunged as far and as fast as they had risen. Pawasar Pawasar Ras could not help knowing his own species, and knowing what its members did and did not do.

The Great One called Solut Mek Kem said, ''By your murderousness, I gather your kind still exists, *vodran*.'' Jennifer felt like screaming at the translator program for falling asleep on the words that really mattered. Meanwhile, Solut Mek Kem went on, ''We all hoped Earthgrip

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE SAGA CONTINUES!

STAR WARS®

FIRST IN A THREE BOOK CYCLE OF ALL NEW ADVENTURES

HEIR TO THE EMPIRE

The vanquished Imperial fleet
returns to destroy the Republic—
and a voice from the past
brings a warning to Luke Skywalker...

BY TIMOTHY ZAHN

Also available on Bantam Audio cassette

A BANTAM HARDCOVER

® and © 1991 Lucasfilm, Ltd. All rights reserved.
Used with authorization as the Star Wars mark is registered.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

would have taken you by the time we returned to the sphere at large."

But for once, the problem was not the translator's fault. Pawasar Pawasar Ras said, "*Vodran*? I do not know this word, Solut Mek Kem."

Vomisa W Nhoj echoed him, less politely: "Trust the stinking *kwopillot* to come up with a foul-smelling name for proper people."

"You've grown old in depravity, to think it the proper state for Foitani," Solut Mek Kem said. "I see the race has had time to degenerate physically as well as morally, else our sphere would not be plagued with such hideous specimens as you."

Vomisa W Nhoj told the Great One what he—or was it she this time?—could do to himself, in explicit anatomical detail. Jennifer did not think any of the suggestions sounded like much fun, and did not think many were physically possible. Those limitations didn't bother humans in a temper, and they didn't bother Vomisa W Nhoj, either.

When the Rof Golani warleader ran down, Pawasar Pawasar Ras added, "You tax us with murderousness, yet, outside this tower which is now a ship, you *kwopillot* wantonly slaughtered a great many Foitani, many of them unarmed and all of them mentally disabled by whatever means you employed to keep us from your precinct on Gilver."

"You are *vodranet*," Solut Mek Kem said. "You deserve no better. As I said, we had hoped our fellows would have exterminated you from the galaxy by the time we reawakened. Though I see it is not so, we shall join with the worlds of our kind and finish the job once and for all."

"What worlds of your own kind?" Pawasar Pawasar Ras said. "*Kwopillot* have no worlds. They merely plague true Foitani whenever a nest of them appears. This is so on every world where our kind survives, and has been so ever since our sphere went down into barbarism."

"Lie all you like, *vodran*," the old-time Foitan said. "We could not have been destroyed in a few centuries."

Jennifer hurried over to Pawasar Pawasar Ras, and tugged on the fur of his flank. "May I speak to the Great One?" she asked urgently.

Pawasar Pawasar Ras brushed her away, or tried to. She hung onto his massive arm. "Are you stricken mad?" he said. "Get away. This is not your concern."

Unexpectedly, Vomisa W Nhoj came to her rescue. "Why not let the creature talk to the stinking *kwopillot*?" he demanded. "Do *kwopillot* deserve any better?

"There is some truth in what you say, warleader," Pawasar Pawasar Ras admitted. Under other circumstances, Jennifer would have been furious at the denigration inherent in what the Rof Golani Foitan said, and in Pawasar Pawasar Ras's agreement with it. Now all she cared about was having this Solut Mek Kem hear her. After a pause for thought that seemed endless, Pawasar Pawasar Ras said, "Very well, human Jennifer, you may speak. Here." He overturned a plastic container for her. "Stand on this, so you will be tall enough for the vision pickup to notice you. I shall stand close by, that my translator may render your words into the speech of the Great Ones."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Thank you, honored kin-group leader." Jennifer clambered onto the container. She could tell Solut Mek Kem saw her; the old-time Foitan's teeth came out. She said, "Honored Foitan—"

"So you *vodranet* consort with sub-Foitani, do you?" Solut Mek Kem interrupted. "We might have expected it of you."

"*Will* you listen to me?" Jennifer said. "Your tower hasn't been sitting on Gilver for a few centuries. You've been there 28,000 of your years."

"It is amusing, *vodran*." Solut Mek Kem still refused to speak directly to Jennifer. "But why should I listen to its lies any more than yours?"

"I presume your tower or spaceship or whatever it really is recorded Bernard and me when we went inside," Jennifer said. "Check those records, why don't you? For one thing, you'll see we have stunners that aren't like yours. For another, you'll see one of your people comparing us to—I don't know whether they're specimens or records of my kind back when we were savages. You figure out how long it might take for a race to go from savages to star travelers. And if I'm lying, then you can go right on ignoring me."

The screen that had shown Solut Mek Kem went blank. Aissur Aissur Rus said, "Well done, human Jennifer. You have made the wicked pervert pause and examine assumptions, something we did not succeed in accomplishing."

Bernard Greenberg said, "You ought to think about examining your own assumptions, Aissur Aissur Rus. Since when is someone who differs sexually from you necessarily a pervert—or necessarily wicked, for that matter?"

"*Kwopillot are* wicked perverts," Aissur Aissur Rus said.

Jennifer felt like banging her head against a wall; Aissur Aissur Rus not only wasn't examining his assumptions, he hadn't even noticed them. She asked, "What's a *vodran*?"

"We do not know this word, either," Pawasar Pawasar Ras said. "It is a piece of offal the *kwopillot* have appended to the pure and beautiful speech of the Great Ones, nothing more."

Just then, Solut Mek Kem reappeared in the holovid screen. "I will converse with the sub-Foitani creature," he announced.

"We call ourselves humans," Jennifer said pointedly.

The Great Ones, whether perverted or not, had all the arrogance of their descendants and then some. Solut Mek Kem said, "I care nothing for what you call yourself, creature. I have some concern, however, over your statements. It appears true that Foitani encountered your kind in the past. You were noted as being uncommonly brutish, and scheduled for extermination. Why this failed to take place is a matter of some puzzlement to me."

Jennifer opened her mouth, closed it again. Hearing that her race was going to have been killed off was not something she could take in at once. Into her silence, Aissur Aissur Rus said, "No doubt the Suicide Wars intervened and prevented the Foitani of that distant time from completing the protocol they envisioned."

"Suicide Wars?" It was Solut Mek Kem's turn to pause. Not even a Foitan could care for the sound of that.

"Suicide Wars," Aissur Aissur Rus

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

repeated. He spoke to the command center's computer system. A holovid star map appeared in front of him. "This is the area the Foitani once inhabited, not so?"

"No. Wait. Yes, it appears to be," Solut Mek Kem said. "We customarily oriented our maps with the other direction to the top, thus my brief confusion."

"One more thing about the Great Ones of which we were ignorant," Aissur Aissur Rus observed before returning to the business at hand: "These are the known Foitani worlds now." The few points of light Dargnil Dargnil Lin had shown Jennifer back on Odern now sparkled in front of her. Aissur Aissur Rus said, "All other worlds within the sphere are devoid of our kind, or even of intelligent sub-Foitani life forms."

"More *vodran* lies, fabrications to confuse me," Solut Mek Kem said.

"If you will arrange a data link with us, we will supply you with documentation sufficient to change your mind," Aissur Aissur Rus said. "We could not have prepared this volume of information in advance to trick you, you will realize, because we had no idea we would discover you alive in the tower, and still less that you would prove to be *kwopillot*." More flexible than most of his kind, Aissur Aissur Rus managed not to affix a malodorous epithet to the term.

"Send your data," Solut Mek Kem said. "The *Vengeance* will refrain from destroying you until they are evaluated—you are no spacecraft, and cannot run. But woe betide you if we detect falsehood. It will only make your fate the harsher."

How could any fate be worse than destruction? Jennifer wondered. She did not speak her thought aloud. The Foitani might have had answers to questions like that.

"Did you notice the name of the ship?" Bernard Greenberg said. "The old-time Foitani who set up the Great Unknown must have figured their side might not win the war. I wonder if they figured no one would win it."

Jennifer thought about the map Aissur Aissur Rus had shown to Solut Mek Kem. She thought about the sphere the Foitani had once ruled, about the handful of worlds they still inhabited. She thought about how many other species the imperial Foitani must have destroyed, about the calm way Solut Mek Kem had remarked that humanity was on their list. Softly, she said, "Maybe that's just as well."

"Maybe it is," Greenberg agreed.

The Foitani in the command center seemed to have forgotten about the humans again, now that Jennifer had bought them some time. That was typical of them, she thought, but she could not make herself angry. She only wished they'd never heard of her in the first place.

Solut Mek Kem came back on the screen after perhaps half an hour. He said, "Our computers have been analyzing and summarizing the information you are presenting to us. The problem does seem rather more complex than we may have envisioned."

From a Foitan, even so small an admission had to spring from profound shock. Jennifer realized that at once. She wondered if Pawasar Pawasar Ras or Vomisa W Nhoj would see it. To

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE BENCHMARK PSYCHO-THRILLER
THAT
REVOLUTIONIZED HORROR LITERATURE...

"...If you've never read FEAR, I urge you to do so."
– Stephen King

BY MASTER STORYTELLER
L. RON HUBBARD
AUTHOR OF 31 NATIONAL BESTSELLERS

Buy your copy today wherever fine books
are sold. Or order direct from the publisher:

BRIDGE PUBLICATIONS, INC.
4751 Fountain Ave., Los Angeles, CA 90029
1-800-722-1733 (1-800-843-7389 in CA)

hardcover: $16.95 – audio cassette: $15.95

Copyright © 1991 Bridge Publications, Inc. All rights reserved. 1101911951.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

them, it might be taken as only a sign of weakness. Before either of them could speak, she climbed on the plastic box and said loudly, "Then you agree it's wiser to talk, Solut Mek Kem, than to try to fight off every starship from every Foitani world that still knows about spaceflight?"

Pawasar Pawsar Ras growled at her. Vomisa W Nhoj snarled at her and took a step in her direction. His clawed hands stretched greedily toward her. She felt like Miles Vorkosigan—much too small and extremely breakable. How would the Middle English SF hero have handled this particular mess? Audacity, that was his only way. She went on quickly, not giving any Foitan a chance to talk: "A peace conference seems the appropriate solution, don't you all think? None of the modern Foitani are likely to get any of the technology of the Great Ones without peace, unless the *Vengeance* shoots it at them. And you Foitani from long ago will only be hounded all through this sphere unless you come to some kind of terms with your modern relatives."

"Peace with *vodranet*? Never," Solut Mek Kem said.

"Talk with *kwopillot*? I'd sooner claw my own belly open," Vomisa W Nhoj said.

Jennifer glumly waited for whatever bellicose ranting Pawasar Pawasar Ras chose. But before the honored kin-group leader could get a rant in edgewise, Aissur Aissur Rus said, "Save over communicators, how can we talk with those on board the *Vengeance*?" Again, he had sense enough to keep to himself the slurs he was no doubt thinking. "If we and they come into the same room, their smell will make us want only to kill, and ours no doubt the same with them."

Jennifer felt like kissing him, no matter how repugnant he might find it. *How* could be solved; *never* left little room for negotiation. She said, "If you wanted to meet face-to-face, as I can see you might, do you have nose filters to keep your two sides from smelling each other?"

"We would still know they were *kwopillot*," Pawasar Pawasar Ras said. Vomisa W Nhoj put it more pungently: "I'd smell that perverts' reek if you cut off my nose."

Solut Mek Kem seemed no more enthusiastic. The *kwopil* said, "Better to exterminate all *vodranet* and begin to populate the sphere anew with Foitani who have not been altered to the point of degeneracy and decay."

"You are the altered ones, you *kwopillot*," Pawasar Pawasar Ras said.

Jennifer filed that away for further consideration; she had more pressing business now. She said, "Don't you think, *kwopillot* and *vodranet*, both sides have done enough exterminating here? Aissur Aissur Rus, call up those maps of how your sphere looked in the days of the Great Ones and how it is now."

Aissur Aissur Rus did as she asked. The few points of light that still glowed in what had been a great shining globe told their own story. Another round of war at that intensity might leave no Foitani of any sexual persuasion alive anywhere. The projection was plain enough for even the big aliens to get outside their ideologies and notice it.

Pawasar Pawasar Ras saw. He said,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"You can destroy us here on Gilver, *kwopillot*, but I doubt you can destroy all our worlds without being slain yourselves in the attempt."

"Let's fight them now," Vomisa W Nhoj said. "The more damage we do to them, the easier a time the attackers who come after us will have." Some people, Jennifer thought, did not want to get the message. But even one of Vomisa W Nhoj's subordinates took the warleader aside and spoke urgently to him.

Solut Mek Kem said, "What a dolorous choice: the galaxy without Foitani or full of accursed *vodranet*. We shall have to consult among ourselves as to which alternative appears the more preferable." He disappeared from the screen.

"Talking with *kwopillot*!" Pawasar Pawasar Ras shook his head in a very human gesture of bewilderment and dismay. "Who would have supposed it would come to that?"

"You know, one of the things Foitani really need to learn, if you'll forgive my telling you, is diplomacy," Bernard Greenberg said. "The Great Ones never seemed to have used it—they were always one people themselves, and other races were just there to be exploited or massacred. Then when they had this split into *kwopillot* and *vodranet*, the only thing they knew how to do with beings who were different was kill them. There are other choices. You Foitani from Odern and Rof Golan—and I suppose your other starfaring races—are starting to get the idea, because you have to deal with each other, and I suppose also because you have the old-time Suicide Wars as a horrible example. But none of you is what you'd call good at dealing with anybody from outside your own immediate group."

"He's right," Jennifer said. "Now you're all in a place where you can see that a big war isn't the right answer, but you don't have any other weapons—you should pardon the expression—handy with which to attack the problem."

"War is simple and direct. Its answers are clear-cut," Vomisa W Nhoj said.

"A writer of my species once said that, for any problem, there is always a solution that is simple, obvious—and wrong," Jennifer answered. Vomisa W Nhoj started to snarl at her, then stopped, looking as thoughtful as any Rof Golani Foitan she'd ever seen. She suddenly laughed. Here she was, doing exactly what the Foitani from Odern had kidnapped her to do—using her knowledge of human literature (even if not science fiction this time) to help them deal with the problem of the Great Ones.

Solut Mek Kem, who personified the problem of the Great Ones, came back onto the screen in front of Pawasar Pawasar Ras. The *kwopil* said, "We will speak with you, unless you would rather fight." By the way that came out in Spanglish, and by the way he let his teeth show, Jennifer guessed he was half-hoping for a battle.

"We will talk with you," Pawasar Pawasar Ras said. "War is the obvious solution, but for every question there is an answer that is obvious, simple, and wrong."

"An interesting point of view," Solut Mek Kem said. Jennifer didn't know whether to be angry at Pawasar Pawasar Ras for taking her thought without giv-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing her credit or glad he had listened to her. She got little time to think it over, for Solut Mek Kem went on, "In any case, we will also talk, I suppose. Do you possess nose filters such as the yellow-haired creature suggested? They might keep our two sides from fighting whether we so intend or not. The odor of *vodranet* cannot help but inflame us."

"I will put our technical staff to work fabricating filters," Pawasar Pawasar Ras answered. "We are similarly aroused —and not in any sexual sense, I assure you—by the way *kwopillot* smell. As for these non-Foitani, they are without a doubt ugly, but they have their uses."

From a Foitan, Jennifer knew, that was about as good a recommendation as she was likely to get.

Just when all seemed sweetness and light (or as close to sweetness and light as was practicable after ground and space combat between two groups that wished extinction on each other), Vomisa W Nhoj reminded everyone that there were in fact not two groups involved, but three: "Nose filters? I don't give a putrescent fart about nose filters. I don't have to smell *kwopillot* to know they stink, either. Let them come after Rof Golan if they've the stomachs for it. We'll blast them into incandescent gas, and better than they deserve, too."

"Oh, shut up, you hotheaded fool," Aissur Aissur Rus said—hardly diplomatic language, but the most direct statement Jennifer had yet heard out of a Foitan from Odern.

Greenberg added, "Vomisa W Nhoj, think about this: suppose they blast your people on Rof Golan into incandescent gas instead? That sort of thing happened all the time during the Suicide Wars. Wouldn't you rather talk first and then fight, given the chance? Think of it in terms of tactics if you don't understand diplomacy. Before you start a war, you ought to learn about your enemies."

"I know they are *kwopillot*. What more do I need?"

"You might remember they're also Great Ones," Jennifer said. "And remember how many ships you just lost. You might even remember that if the Foitani from Odern do talk with them and you don't, they might make common cause and leave you out in the cold."

"We would not do that," Pawasar Pawasar Ras and Aissur Aissur Rus protested in the same breath, so perfectly in chorus that the translator turned the two sets of identical words into a single sentence. Were less riding on it, it might have been funny.

However pious their protest, the two Foitani from Odern failed to convince Vomisa W Nhoj. "Of course you would, if you saw any advantage to it," he said. "You Oderna are like that, and what's more, you know it perfectly well. But if you think you'll make a deal with the perverts behind my back, think again. This creature has given me a good reason to enter into these talks: to keep you as honest as may be."

"Congratulations," Greenberg told Jennifer. "You've just made this a problem with three sides instead of two. Now the Rof Golani are ready to take on the Foitani from Odern again."

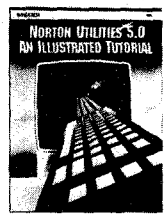
"Maybe there are three sides, but they're all going to talk," Jennifer answered. "When there were just two,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

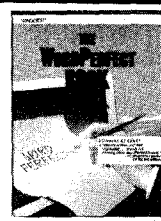
Take Any 2 Books for only $2.95

(a $59.90 value)

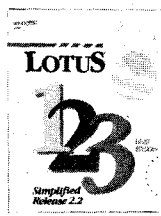
Your complete source for business and personal computing books . . . at discount prices!



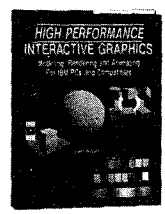
3720 $26.95



3616P $17.95

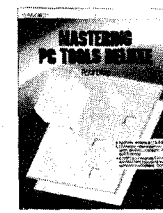


3440P $18.95



2879P $22.95

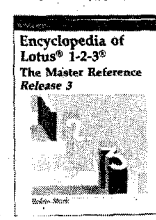
3131 $26.95



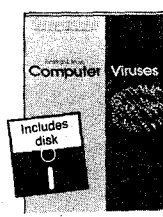
3578P $16.95

3006P $29.95

3563P $22.95



3211P $24.95



3382P $29.95

The Computer Book Club℠

c/o ANALOG Magazine Dept. C61
380 Lexington Ave., New York, NY 10168-0035

☐**YES!** Please accept my membership in The Computer Book Club and send me the 2 selections I have chosen, billing me $2.95. If not satisfied, I may return the books within 10 days without obligation and have my membership cancelled. I agree to purchase at least 3 additional books during the next 2 years at low Members' Prices and may cancel anytime thereafter. I will receive the Club Bulletin 15 times a year. If I want the Main Selection, I will do nothing, and it will be shipped automatically. If I want an alternate selection–or no selection at all–I will notify the Club by returning the card provided. I will receive Dividend Certificates with every book purchased at regular Club prices to qualify for additional special discounts of up to 80%. A shipping/handling charge and sales tax will be added to all orders.

Name _____

Address _____

City _____ State _____ Zip _____

Signature _____

Valid for new members only. Foreign applicants will receive special ordering instructions. Canada *must* remit in U.S. currency. This order subject to acceptance by The Computer Book Club.

ANA691

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

they weren't talking. Sometimes even going backwards is progress."

"I'm sure the Foitani from Odern would have agreed with you, the way they blindly loved the Great Ones till they found this batch of *kwopillot*."

Before Jennifer could answer, Solut Mek Kem said, "If we are to enter into these distasteful discussions, *vodranet*, let us begin. We will send down a flier to bring your representatives back here to the *Vengeance*."

"Come up into your lair?" Vomisa W Nhoj exclaimed. "Do you take me for a male altogether bereft of his senses? Treating with the Oderna is quite bad enough. Why should I tamely walk in and let you do as you would with me?"

"The wiser course would be for your envoys to come down to this research station," Pawasar Pawasar Ras said.

"That will not happen," Solut Mek Kem said at once. "We have already seen how you treat our kind when we approach this research base of yours. You merely seek the opportunity to dispose of our representatives quietly."

"Your behavior toward the Rof Golani in the precinct of the Great Unknown and toward the fliers of both sides in our recent dispute naturally leaves us suspicious of your good intentions," Aissur Aissur Rus said.

"We will not meet with you inside your station," Solut Mek Kem said.

"We will not meet with you inside your spaceship," Pawasar Pawasar Ras said.

"I wouldn't want to meet you *kwopillot* squatting over a waste-disposal hole," Vomisa W Nhoj added.

"These talks aren't off to what diplomats call a constructive start," Greenberg observed.

Jennifer could only reply with a mournful shake of her head. If the parties allegedly negotiating couldn't even agree on where they would allegedly negotiate, the alleged negotiations looked anything but promising.

Then she said, "If the one side won't come down here and the other won't go up there, why don't you all come to the human ship, the *Harold Meeker*?"

"Yes, why not?" Greenberg chimed in. Under his breath, he added for her ears alone, "Anything to start this moving and give us a chance to get out of here." Jennifer let out a small, silent sigh of relief; it was his ship, after all, that she'd just proposed as a negotiation site.

"Come aboard the human ship for these discussions?" Pawasar Pawasar Ras said. "I would almost prefer boarding the *kwopillot* in their den." Jennifer blinked and wondered what the literal Foitani version was of the phrase the translator had rendered in that fashion.

"Go aboard a ship constructed by creatures?" Solut Mek Kem said. "We do not treat with creatures; we destroy them."

"You wouldn't be treating with us. You'd be treating with Pawasar Pawasar Ras and Vomisa W Nhoj," Greenberg said. "I might add, just so you know, we humans range across as much space as you Foitani did when your empire was at its height."

"You are telling me you are widespread and dangerous vermin," Solut Mek Kem said.

"I'm telling you we're widespread and dangerous, yes," Greenberg an-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

swered, "but to us, you are the vermin. You'd better bear it in mind."

Solut Mek Kem snarled at that. So did Vomisa W Nhoj. So did Pawasar Pawasar Ras, but not as loudly. Aissur Aissur Rus said, "Unlike others here, I have been into human space. They lack our race's straightforward character, but are not to be taken lightly. Success is the best measure of a species' true attributes; by that standard, their attributes are formidable indeed."

"They are small and weak and ugly." This time Solut Mek Kem and Vomisa W Nhoj said the same thing together. Neither looked happy at agreeing with the other.

Well, you Foitani are big and fuzzy and vicious, Jennifer thought. She kept it to herself. Studied insult of the sort Greenberg had given was one way of breaking through the arrogant contempt with which the Foitani viewed those who were not of their kind. Indulged in too often, though, it degenerated into name-calling of the sort five-year-olds used when they argued over toys.

"Just remember, the *Harold Meeker* is neutral ground," Greenberg said. Now he sounded calm and reasonable and persuasive: downright diplomatic, Jennifer thought—too bad the translator would wash all tone from his words. He went on, "Neither of you trusts the other's stronghold. If you can't trust my ship, at least all of you can distrust it equally."

"You are in the company of *vodranet*, creature," Solut Mek Kem said. "Before we would hazard ourselves, we demand the right to examine the proposed chamber for booby traps. *Vodran* treachery is notorious and despicable."

"Inspect all you like," Greenberg agreed cheerfully.

"We will have monitors present when the putative inspectors board your ship, human Bernard," Pawasar Pawasar Ras said. "Who knows what *kwopillot* might install under the pretext of removal?"

"That's fine, too," Greenberg said. "If both kinds of Foitani are going to be on the *Harold Meeker* at the same time, though, everything had better wait until you get those nose filters designed. I don't want anybody blowing holes in my cargo bay because he doesn't like the way someone else smells."

"One other thing," Jennifer added. "Everyone should remember that ships from Gilver are on their way to Odern and to Rof Golan. They'll probably bring big war fleets back with them. It would be nice to have some sort of agreement by the time those fleets get here. If we don't, I think another round of Suicide Wars starts right here. Is this fight worth your whole species?"

After she asked the question, she realized all flavors of Foitani could be intransigent enough to answer *yes*. When no one, not even Vomisa W Nhoj, said anything, she counted that a victory. The modern Foitani still lived in the long horrid shadow of the Suicide Wars; they knew too well what another round of such insensate frenzy would do to their surviving worlds. As for the newly revived Great Ones, perhaps they were still in shock from learning what the rest of their race had done to itself while they lay dormant through the millennia.

Greenberg prodded everyone along: "Have we decided, then, to meet in the cargo hold of the *Harold Meeker* as soon as nose filters make it possible?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Again, none of the Foitani said anything. Again, Jennifer counted that a victory.

Being back in the *Harold Meeker* was almost as good as being home on Saugus, at least when the alternative was the Foitani research base. The lighting felt right to human eyes, the plumbing fixtures were as they should be, the chairs were made for human fundaments—and, best of all, the Foitani kept out of the crew compartment.

They stayed busy down in the cargo bay. They moved around boxes and bales to create a clear space on the floor where they installed their own furniture and computer gear. The Great Ones cleared out bugs set by the Foitani from Odern. The Foitani from Odern, in turn, cleared bugs set by the Great Ones. The Foitani from Rof Golan took a turn clearing everyone else's bugs, and, presumably, planting a few of their own.

All the Foitani of whatever race who entered the cargo bay wore a little silvery button in each nostril. ("The better not to smell you, my dear," as Jennifer said to Greenberg.) The nose filters seemed to work; at least, no fights broke out between *kwopillot* and *vodranet*. Greenberg manufactured a little silvery button of his own and left it on an out-of-the-way box. A suspicious Foitan from Rof Golan found it and took it away, either to destroy it or to glean from it what he could of human electronics.

"Good luck to him," Greenberg said when he discovered his little bait had been taken. "It's filled with talcum powder."

He and Jennifer got Foitani electronics to study: they persuaded Aissur Aissur Rus to give them each a translator. "I'm bloody tired of having Foitani talking all around me without the slightest idea of what they're saying," she said.

"True enough," Greenberg said, "but now that we are supposed to understand them all the time, they'll ask more from us. You'll see."

That hardly struck Jennifer as requiring the mantic gift to predict. Greenberg was proven right soon enough, too. All Foitani factions distrusted the humans and affected to despise the *Harold Meeker*. All of them, however, distrusted their furry fellows even more and actively feared the headquarters of those fellows. Thus Jennifer and Greenberg spent a good deal of their time keeping the Foitani from one another's throats. When the actual discussions started, all factions insisted that the two of them sit in as mediators.

To keep potential carnage to a minimum, only two representatives from each group went inside the trading ship's cargo bay. Pawasar Pawasar Ras and Aissur Aissur Rus spoke for the Foitani from Odern, Solut Mek Kem and a colleague named Nogal Ryn Nyr for the Great Ones, and Vomisa W Nhoj and his chief aide Eugarps L Pmaked for the Foitani from Rof Golan.

At the first uneasy meeting, all three sets of purported diplomats spent the first several minutes standing around and glaring. Vomisa W Nhoj let out a series of ostentatious sniffs. His nose filters must have been working, though, or he would not have been so restrained. Since the Great Ones and the Foitani

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Presenting:

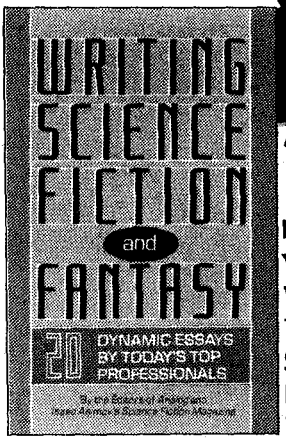
WRITING SCIENCE FICTION AND FANTASY

From The Editors Of

SCIENCE FICTION analog SCIENCE FACT®

and

ISAAC ASIMOV'S SCIENCE FICTION MAGAZINE



SAVE 25%

DO YOU WANT TO BE A SCIENCE FICTION WRITER?

The inside tips and trade secrets of todays foremost professionals: **ISAAC ASIMOV** on New Writers, Dialog, and Revisions . . . **ROBERT A. HEINLEIN** on Writing Speculative Fiction. . . . **POUL ANDERSON** on Imaginary Worlds, **CONNIE WILLIS** on Comedy. . . . **NORMAN SPINRAD** on Far, Far Futures. . . . **JANE YOLEN** on Fantasy . . . **JAMES PATRICK KELLY** on Characterization . . . **AND MUCH MORE!**

Buy from the editors directly and save over *25%* off the *$17.95* cover price!

☐ Please send me **WRITING SCIENCE FICTION AND FANTASY**, I've enclosed my check for *$12.95* (plus $3.00 for postage and handling)

☐ Please charge my ☐ Visa ☐ MasterCard ☐ American Express

My card #_____

Exp. date_____

NAME_____

ADDRESS_____

CITY_____ STATE____ ZIP_____

MXWG-0

Mail To:
Science Fiction Manual
P.O. Box 40
Vernon, N.J. 07462

Books will be shipped by UPS.
Please allow 2-3 weeks for delivery.

OUTSIDE US & POSS ADD $12.00 PRICE INCLUDES GST
ALSO AVAILABLE AT YOUR LOCAL BOOKSTORE.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

from Odern seemed willing to ignore him, Jennifer did the same.

She said, "Let's start this off with an issue that I hope we can easily deal with. It doesn't involve any quarrel between the newly revived Foitani and their modern relatives. In fact, it concerns us humans. Solut Mek Kem, do you really have specimen humans aboard your ship" (she almost said, *your tower*) "or are they just images in your data storage system?"

"The distinction is not as clear as you make it, ignorant alien creature," Solut Mek Kem answered. "They are at present potential, but could be realized in actuality. Do you seek live copies?"

Jennifer gulped. She looked at Greenberg. He seemed shaken, too. Taking a pair of genuine Paleolithic people back to human space would set every anthropologist's pulses racing, and likely would be worth millions. But would it be fair to the poor Cro-Magnons themselves? Could they ever be anything more than specimens? How could they possibly adjust to twenty-eight millennia of changes?

"Do you seek live copies?" Solut Mek Kem repeated.

"Let us think about that. It's not something we have to decide right now," Jennifer answered. If the cave humans had been frozen so long in Foitani data storage, a little longer wouldn't hurt anything. She went on, "Tell me the meaning of a term you use, one our translator does not interpret: *vodran*."

"These are *vodranet*." Solut Mek Kem pointed to the Foitani delegations from Odern and Rof Golan. "They are depraved and disgusting."

"They call you *kwopillot*, and say you're perverted and revolting," Greenberg said. "We needed a good deal of work, but we finally got them to explain what *kwopillot* were. I'm not of your species; I make no judgments about what's right or wrong as far as your sexual habits go. But right or wrong, they're an important issue here, one the human Jennifer and I need to understand. Could you please explain to me what makes these Foitani *vodranet*?"

"Explain to us as well," Aissur Aissur Rus added. "This is not a word my people comprehend."

"Nor mine," Vomisa W Nhoj said. "What could be vile enough for a stinking *kwopil* to despise?"

"You could," Nogal Ryn Nyr told him. Aissur Aissur Rus at least grasped the concept of diplomacy, even if he didn't always use it very well. Vomisa W Nhoj hadn't a clue, and infuriated other people with his own aggressive lack of tact.

"Stay calm, everyone," Jennifer said, wondering how she and Greenberg could make the Foitani stay calm if they didn't feel like it when they were about the size (and disposition) of a like number of bears. She went on, "We're here to discuss your disagreements rationally, after all." She wished disagreements about sexual habits more readily lent themselves to rational discussion.

"Let's try again," Greenberg said. "Foitani from what is now the ship *Vengeance*, what are *vodranet*? We can't have any kind of discussion if we don't all understand what our terms mean."

"Discussing matters pertaining to reproduction is not our custom under most circumstances," Solut Mek Kem said—a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

view he had in common with Pawasar Pawasar Ras, though he didn't know it. "It is doubly unappetizing when attempting to evaluate manufactured monstrosities such as *vodranet*."

The Great One obviously bought tact from the same store that had sold it to Vomisa W Nhoj. The Rof Golani Foitan yelled, "You're the monster, *kwopil*!"

Greenberg yelled, too: "Enough!" Trying to out-shout a Foitan was like trying to hold back a spaceship with bare hands, but he gave it a good game go. "Let Solut Mek Kem finish, will you? You can say whatever you want when he's done."

Fortunately, Aissur Aissur Rus supported him: "Yes, calm yourself, Vomisa W Nhoj. Gather intelligence before commencing operations." Advice set in a military context seemed to get through to the warleader. He snarled a couple of more times, but subsided.

"Solut Mek Kem?" Jennifer said.

But Solut Mek Kem, again like Pawasar Pawasar Ras, refused to go on. He gestured toward Nogal Ryn Nyr. *Let the flunky do the dirty work,* Jennifer thought—some attitudes crossed species lines. After a couple of false starts, Nogal Ryn Nyr said, "An unfortunate discovery made long ago is that the sexual physiology of Foitani is all too easy to alter."

"That is true enough," Aissur Aissur Rus said. "The problem of *kwopillot* would not exist were it otherwise."

"We, obviously, perceive it as the problem of *vodranet*," Nogal Ryn Nyr said. "And with greater justice, for, after all, *vodranet* represent a distortion of the original Foitani pattern, which is to say, ourselves."

Jennifer needed a second to grasp the implications of that. The Foitani from Odern and Rof Golan caught on quicker. The bellows of outrage they emitted, however, were so loud and so nearly simultaneous that they overloaded her translator, which produced a noise rather like an asthmatic warning siren.

Finally Vomisa W Nhoj shout roared everyone else: "You lie as bad as you smell! We are the true Foitani, the true descendants of the Great Ones, not you wrongsex badstink perverts."

"Were you there in those days, *vodran*?" Nogal Ryn Nyr shot back. "How do you know whereof you speak? We can prove what we say, just as, regrettably, you appear to have proven to us the existence of the Suicide Wars and their long and painful aftermath."

"Who would believe proof from a *kwopil*?" Eugarps L Pmaked said. By all the signs, his charm easily matched that of Vomisa W Nhoj.

"The suggestion is implausible on the face of it," Aissur Aissur Rus said, more politely but just as certainly. "How is it that all modern Foitani worlds are populated by normal Foitani—Foitani I would judge normal, at any rate—and *kwopillot* are universally reckoned aberrations?"

"The reason is painful to me, but nonetheless obvious," Nogal Ryn Nyr said: "It appears that, insofar as the Suicide Wars had winners, those winners were *vodranet*. No doubt massacres on planets reduced to barbarism completed the overthrow of normality by—your type."

In her mind, Jennifer saw mobs of big, green-blue aliens rampaging through bombed-out cities, sniffing like blood-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

hounds for the hated scent of those different from themselves. Would there have been massacres at a time like that? By all that she knew, the Foitani were appallingly good at massacres; they almost seemed the chief sport of the species, as battleball was for humans. The picture Nogal Ryn Nyr painted had an air of verisimilitude that worried her.

It convinced Vomisa W Nhoj, too; he said, "You deserve being massacred."

"We thought the same of *vodranet*, I assure you," Nogal Ryn Nyr said. "Our chief mistake appears to have been waiting too long before attempting to stamp you out."

"I will believe none of this without proof," Pawasar Pawasar Ras said. "Nothing impedes you from making any claim you like, simply for the purpose of improving your own position at these discussions."

Solut Mek Kem tossed a silvery wafer onto the table, then, after some hesitation, another one, the latter in the direction of Vomisa W Nhoj and Eugarps L Pmaked. "Here are the data," he said. "Shall we adjourn until you have put them in your computers and had the opportunity to evaluate them?"

"Let's wait one Gilver day—no more," Greenberg said. "Remember, fleets are on the way. You can start the fighting all over again, if you like."

Jennifer waited for Vomisa W Nhoj to say that was a good idea. But even the Rof Golani warleader kept quiet. He picked up the little data storage device as if it were a bomb. In a way, it was, for it seemed likely to blow away his misconceptions of his species' past. The four modern Foitani were quiet and thoughtful as they left the *Harold Meeker*'s cargo bay. When they were gone, the Great Ones left too.

"Whew!" Jennifer sagged against a box which Greenberg had neatly labeled *Foitani electronic widgets*. "Far as I'm concerned, the diplomats are welcome to diplomacy. Give me a simple trading run any day."

"You said it, especially when the people we're supposed to keep from each other's throats are as all-around charming as the Foitani," Greenberg said. "Right now, I would kill for a beer; Foitani kibbles and water aren't my idea of a way to unwind."

Jennifer quoted Heinlein: "One more balanced ration will unbalance me."

"I second that," Greenberg said, approving of the sentiment without recognizing the source. He went on, "The other thing is, I don't know whether we ought to be encouraging the Foitani to make peace with each other or to slug it out. If they do band together and have the technology of the Great Ones to use, they could turn into a real handful for the human worlds to deal with. But I can't say I'm eager to think of myself as the fellow who touched off the second round of the Suicide Wars."

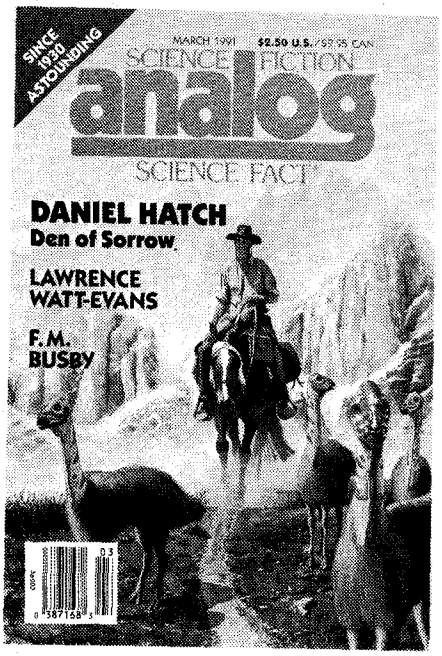
"I know." Jennifer turned and thumped her head against the box of widgets. "The trouble with the Foitani is, they have no notion of moderation whatsoever. Whatever they think, whatever they do, they think it or do it all out, and they're sure anybody who thinks or acts differently deserves nothing better than to have her world blown up. Still, setting them at each other's throats—"

"How could we look at ourselves in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

THE PAST, THE PRESENT, THE FUTURE, THE UNKNOWN.

SUBSCRIBE NOW AND SAVE 29% OFF THE BASIC PRICE
CALL TOLL-FREE 1-800-333-4561



YES SEND ME:

☐ Please send me 18 issues for only $ 9.50 —save 29% off the basic price.

☐ Please send me 12 issues for only $1 9.97.

SCIENCE FICTION
analog
SCIENCE FACT®

Mail to: P.O. Box 7060, Red Oak, owa 51591

Name_____

Address_____

City_____

State_____ Zip_____

Outside US & Poss. 12 for $25.97, 18 for $38.75. PRICE INCLUDES GST

Please allow 6-8 weeks for delivery of first issue. All foreign orders must be paid in advance in U.S. currency.

We publish two double issues in January and July.
Each double issue counts as two issues towards your subscription.

HXSC-9

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

a mirror afterwards?'' Greenberg walked over next to Jennifer and thumped his head, too. ''The thing is, as best I can tell, getting them to slaughter each other will be a lot easier than making any sort of peace. And if they do have peace among themselves, how do we keep them from attacking all their neighbors? That seems to be the way they use peace among themselves.''

''From time to time, when I remember, I think I'd like to live through this, no matter how it turns out,'' Jennifer said.

''Me, too.'' Greenberg made his hair-pulling gesture. ''I'm going up to the living quarters and take a shower. Maybe once I soak my head, all this will make better sense. Somehow I doubt it, though.''

Jennifer rode up the lift with him. As usual, just being in an area designed by humans for humans cheered her up. Even the noise of the plumbing in the refresher chamber as Greenberg washed himself reminded her of other trading ships and of planets where she'd lived. The sound of Foitani plumbing reminded her of nothing but kidnapping and fear.

Greenberg came out with a towel around his middle. ''You want a turn?''

''At what?'' With a mischievous smile, she pulled down the towel. When Greenberg reached for her, she skipped back. ''There, you'll see, the communicator will chime just as we get started.'' Her words didn't stop her from undoing the straps of her coverall.

Just as they got started, the communicator chimed. Jennifer said somethng rude. Greenberg said, ''You might as well have had that shower.'' He sounded more resigned than martyred.

Voice replaced the insistent chiming: ''Humans Bernard and Jennifer, this is Aissur Aissur Rus. I would like to consult with you concerning the new information presented by the'' —he hesitated, plainly not wanting to call them either Great Ones or *kwopillot*— ''by the recently revived Foitani from the Great Unknown.''

''Go ahead,'' Jennifer said, knowing perfectly well that he would go ahead whether she invited him to or not.

''Although analysis can at this s age be only preliminary, the data appear to possess validity.''

''Do they?'' Jennifer wasn't surprised. Solut Mek Kem and Nogal Ryn Nyr had seemed very sure of themselves. But if the Great Ones had originally been *kwopillot,* that made a hash of everything the successor races believed about themselves and their past. In an abstract way, she admired Aissur Aissur Rus for being able to acknowledge that. He had a lot of integrity, but he couldn't be very happy right now.

He said, ''As I stated, they appear to.'' He wasn't going to concede anything he didn't have to, integrity or no. Jennifer supposed she couldn't blame him.

''If they were *kwopillot*, how did you get to be *vodranet*?'' Greenberg asked. ''Did a mutation spread through the species?''

''In a manner of speaking, yes,'' Aissur Aissur Rus said, and said no more.

Having dealt with Foitani for some time, Jennifer suspected that abrupt silence meant he knew something he

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

didn't care to let out. She tried to figure out what might make him reticent, and asked, "Was it by any chance an artificial mutation?"

More silence from the communicator. Greenberg drew his own conclusions from that, and made silent clapping motions. Finally, Aissur Aissur Rus said, "If the records of the *kwopillot* are to be trusted, it was, yes." The translator was emotionless and Foitani from Odern didn't sound upset even when they were, but Jennifer knew he was anything but happy. He went on, "If they can be believed, our variety of Foitan was—engineered—for no better purpose than increasing the variety of sexual pleasure available to every individual."

"What's wrong with that?" Greenberg said, in spite of Jennifer's frantic shushing motions. With the Foitani attitude about sex, anything that had to do with sensual pleasure was automatically suspect.

Aissur Aissur Rus said, "I can conceive of no greater humiliation. How would you like it if your entire species had been deliberately redesigned, merely to allow a greater number of sexual opportunities to its members?"

Put that way, Jennifer thought, it didn't sound appetizing. It had to be all the more galling for the Foitani, who had spent the millennia since the Suicide Wars thinking their original configuration a horrible perversion.

"No wonder it is so easy to produce *kwopillot*," Aissur Aissur Rus went on. "They are, after all, merely a reversion to our former evolutionary pattern. If the Great Ones are to be believed, the origins of *vodranet*—our origins—sprang from the desire of some Foitani at the time to experience both male and female sexual pleasure, which are for us quite different in sensation. Others resisted the introduction of such a radical change into the germ plasm of the race, and the result—the result appears to have been the Suicide Wars."

Jennifer said, "Aissur Aissur Rus, of all the Foitani I've met, regardless of race, you strike me as the most adaptable. The new data from the Great Ones seem to have crushed you. What do the rest of your people think about what you've found out today?"

"Pawasar Pawasar Ras has gone into his quarters. He has spoken to no one. He has forbidden me to discuss this with any person. I have chosen to interpret that to include only Foitani. Our sexual difficulties and conflicts must be of merely academic interest to you humans."

"Not if we end up getting killed on account of them," Greenberg said.

"Yes, that might affect your thinking to some degree," Aissur Aissur Rus admitted. "Nevertheless, although I have always been one to favor the expansion of knowledge by whatever means become available—as witness my recruiting the two of you to help enter the Great Unknown—I would, for the sake of my species' future, be willing, indeed eager, to see that no mention of what we have learned here ever reached Odern."

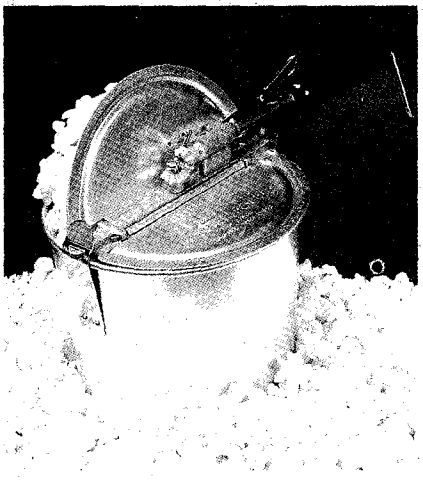
"The only way to make sure of that would be to destroy the *Vengeance*," Jennifer said.

"Were it in my power, I would cheerfully do so," Aissur Aissur Rus said. "Unfortunately, however, the *kwopillot*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

MAIL ★ ORDER ★ MALL

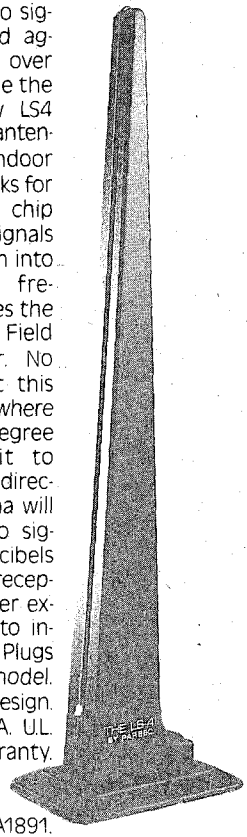
▼ GOURMET POPCORN POPPER



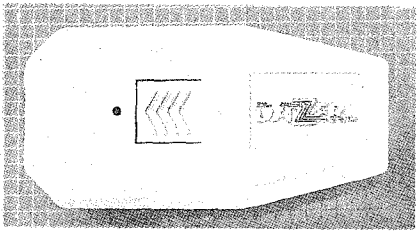
All new high temperature 6 qt. popcorn popper. Most electric and hot-air poppers "puff" the corn more than they "pop" it, leaving it tough with hard centers. This flat-bottomed stove-top popper reaches 475° and pops full in two minutes with 6 quarts of the best popcorn you ever tasted. Stirring paddle with through-the-crank handle virtually eliminates burnt or unpopped kernels. Wooden handle for safe grip, two dump lids. Pop without oil for delicious diet popcorn. 370 calories per 4 qt. bowl. Produce tender, fluffy, old fashioned movie theater popcorn. Made in the USA. **$27.98** ($5.25) #A1963.

▼ THE BEST RECEPTION EVER!!

Eliminate radio signal fade and aggravating cross over signals that garble the sound. The new LS4 omni-directional antenna is the only indoor antenna that thinks for itself. The micro chip brain receives signals and isolates them into individual clear frequencies. Features the Gallium Arsenide Field Effect Transistor. No need to redirect this antenna. Leave it where it is and its 360 degree radius allows it to receive from any direction. This antenna will boost your radio signals up to 24 decibels for the clearest reception you have ever experienced. Easy to install, light weight. Plugs into any stereo model. Unique modern design. Made in the U.S.A. U.L. listed. 1 year warranty. Dimensions: 3" x4.125" x 17.25". **$58.98** ($5.25) #A1891.



▼ THE DAZER™

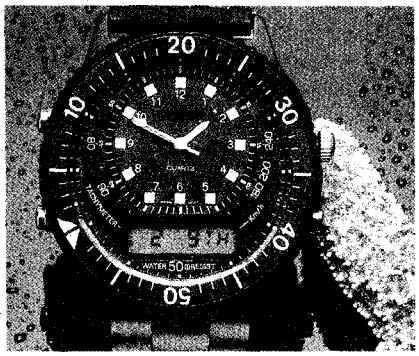


Even the most dedicated canine aficionado can sometimes encounter unfriendly dogs. Dazer™ provides a humane way to repel their advance, emitting ultrasonic sound waves inaudible to humans and totally safe for dogs (unlike mace and other common deterrents). Pocket size (4¾" long) plastic case can also clip on belt; takes 1-9V battery, included. For joggers, hikers, bikers, seniors and kids—plus the proverbial postman. **$29.98**, ($3.00) #A1829X.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

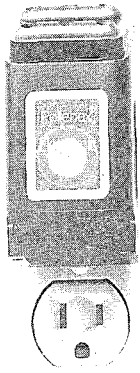
▼ DIVER'S WATCH

The Diver's Watch, priced under $50, is rated waterproof to 5 atmospheres (over 150'). The movable bezel, case and band are all "black chrome" plated in a rugged matte finish. Two sunken faces provide fully independent digital and analog timekeeping, so you can set one face to home time and one to travel time. Date, day and month display; alarm; 1/100 second chronograph with lap timer; choice of hourly chime, 12 or 24-hour format. Precision Japanese movement. 1-yr. warranty. **$39.98** ($5.00) #A1490.



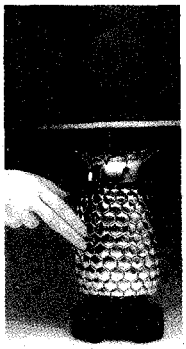
▼ INNOVATIVE IONIZER

A sophisticated electronic device that uses nature's way of cleaning air — emitting trillions of negatively charged ions that act like magnets, attracting microscopic particles of dust, smoke and pollen. This tiny unit (1½"x3") provides an ingenious solution, plugging right into any wall outlet. With "on" indicator light and collector pad that can be rinsed. **$39.98** ($4.00) #A1867.



▼ TEACH AN OLD LAMP NEW TRICKS

Any lamp that takes a standard bulb can be updated with the Touch-tronic dimmer. No rewiring needed-just screw into lamp socket. Then your touch on any metal part becomes the "switch"-touch once for low light, again for medium, a third time for full wattage. Perfect for metal-base lamps, since you can touch anywhere; easy enough on others because touching the harp, shade frame, socket or even a metal finial will work. Handy (and safe) when you're entering a dark room, great at bedside (no more wee-hours fumbling) and a real comfort to the arthritic or the ill. You'll save time, money and electricity-no more 3-way bulbs to buy and you pay for only as much light as you need. U.L. listed; one-year factory warranty. **$15.98** ($4.00) #A1700. 2 for **$27.98** ($6.00) #A17002.



TO ORDER: Send check with item number for total amounts, plus shipping & handling shown in ( ) payable to **MAIL ORDER MALL**, Dept. 061 AN P.O. Box 3006, Lakewood, N.J. 08701, or call TOLL FREE **1-800-365-8493**. NJ residents add 6% sales tax. We honor MasterCard/Visa. Sorry, no Canadian, foreign, or C.O.D. orders. Satisfaction Guaranteed. 30 day money back guarantee for exchange or refund. Allow 30 days for delivery.

Magalog Marketing Group Inc. 1990
1905 Swarthmore Ave., Lakewood, N.J. 08701

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

are much more likely to destroy me. Perhaps the soundest course would be merely to string these discussions along until the fleets from Odern and Rof Golan arrive, and hope they can rid us of the *Vengeance*—and our problem—once and for all."

"If it is, you've just given the game away," Greenberg pointed out. "Or don't you think the Great Ones are monitoring your radio traffic?"

"I say nothing they could not reason out for themselves," Aissur Aissur Rus answered. "They are depraved and perverse; they are not foolish." That was a distinction most humans would have had trouble drawing; Aissur Aissur Rus was able to be dispassionate even over matters that involved his passions.

"The other thing is, you don't think even full warfleets could beat the Great Ones, so you'd better talk with them," Jennifer said.

"You overstate the case," Aissur Aissur Rus said. "I am in doubt as to the likely outcome. The same must hold true for the *kwopillot*, else they would feel no need to continue discussions with us."

"You may well be right about that," Jennifer said.

"You humans have sexual deviants; I read of them in some of the materials in your course, human Jennifer. How is it that you have failed to destroy yourselves as a result of this fact?"

"That's a good question," Jennifer said slowly. Aissur Aissur Rus had a knack for asking good questions. That was probably how he'd come to be a leader of the team investigating the Great Unknown. He'd even gotten answers to his questions there, though by now he wished he hadn't.

Greenberg said, "One difference between Foitani and humans is that humans who differ sexually don't stand out in any obvious way like smell. When we fight, we fight about things like religion or politics or race, not sex."

Jennifer had what she thought for a moment was a brilliant idea. Then she realized that if it were all that brilliant, the Foitani would have thought of it for themselves. She threw it out anyway, to let Aissur Aissur Rus shoot it down if he wanted to: "Is there any chance that you and the *kwopillot* could put on perfumes that would keep you from going berserk at each other's odors?"

"There are no records of this succeeding," he answered. "The pheromones are most distinctive and most different. In any case, we need to be able to perceive these pheromones if we are to function sexually."

"Just a thought," Jennifer said, remembering that she had been about to function sexually before Aissur Aissur Rus called. She wasn't even angry at the Foitan; by now, she was used to getting interrupted.

For a miracle, Aissur Aissur Rus gave up about then and broke the connection. Grinning—he must have been thinking along with her—Greenberg stepped close. "Shall we try again, and see who calls next?"

"Sure, why not?" Then she asked, "What all do you have in the cargo bay, anyhow? A proper science fiction hero—or even heroine—would be able to improvise his way out of trouble with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

something that had been sitting there all along, just waiting to be used."

"You're welcome to look," Greenberg answered. "If you think you can improvise a way out of this mess with a bunch of trade junk, go right ahead and try."

"Maybe another time," Jennifer said. "Thing was, SF writers had the habit of putting things that would really help into cargo bays. I've got the feeling that real life isn't so considerate."

"The only thing real life has been considerate about is giving me the chance to fall in love with you. Even then, the damned Foitani keep calling at the wrong time."

"They aren't calling right now," Jennifer said softly.

"So they're not. Let's enjoy it while we can."

"What are you doing, human Jennifer?"

"Just examining cargo," she answered. Since the Foitan on the communicator had known her name, it was probably someone from Odern. Whoever it was, he had to have been monitoring her through some of the spy gear aboard the *Harold Meeker*. If she and Greenberg could sell that alone to one of the more paranoid human intelligence services, they would show a profit for the trip. The only problem there was getting the goods to the marketplace.

Armed with Greenberg's labels and the computer to give her more details about what was in each crate or box or plastic bag, and with a pry bar, she wandered through the cargo bay, opening packages that looked interesting. A lot of them were interesting: pelts and spices and books and works of art and electronics. She knew she would have had trouble assembling such a rich variety of goods while keeping everything of high quality, as Greenberg had. He deserved his master rating. Somebody back in human space would be sure to want everything the *Harold Meeker* carried, and want it enough to pay highly for it.

Whether any of it would be of any use in keeping the next round of the Suicide Wars from breaking out was another matter. Maybe the Great Ones would admire some of the sculptures produced by a planet-bound Foitani race with which Odern traded, but that would not keep them from hating the artists as so many *vodranet*. Maybe the Foitani from Odern made marvelously compact and clever holovid scanners, but that would not keep them from loathing *kwopillot* or, if the claims of the old imperial Foitani got loose among them (as was very likely), from despising themselves as altered versions of the original Foitani plan they had been trying for so long to emulate.

Frustrated by her complete inability to find anything that might stop big bluish aliens from massacring one another, Jennifer gave up and went back to the crew compartment. "Any luck?" Greenberg asked when she came out of the lift.

"None. Maybe a little less." She ran her hands through her hair, made tugging motions at it the way Greenberg did. "I should have known better. We don't have a writer stowing away a *deus ex machina* for us. We're going to have to do this ourselves, with our brains."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Which haven't done us a whole lot of good so far."

"Isn't that the sad and sorry truth?"

Negotiations resumed the next day. The representatives of the Great Ones started things off by declaring in unison, "We have the solution to this problem."

"You and all your perverts are going to go and commit suicide so you don't bother decent Foitani any more?" Vomisa W Nhoj asked. From a human or an alien of different character, that would have been sarcasm. Jennifer thought the odds favored Vomisa W Nhoj's meaning every word of what he said.

Pawasar Pawasar Ras said, "Despite contemplation, I have not come upon anything that so much as approaches such a solution. I would be willing to hear one from any source, even a source as unreliable as *kwopillot*."

"Yes, tell us," Greenberg urged. "Jennifer and I haven't found anything that looks like an answer, either."

"Very well." Solut Mek Kem spoke for the old-time Foitani now: "The solution is classic in its simplicity. You have seen that *vodranet* are an unnatural alteration of the true Foitani way of being. Is this so, or not?"

"We see that the Great Ones appear to have been *kwopillot*, yes," Aissur Aissur Rus said. "Nevertheless, since the Suicide Wars we have built our own reality."

"What you say, though, *kwopil*, appears to remain in essence true, if bitter," Pawasar Pawasar Ras said. "If we are to have emulation of the Great Ones as our goal, we must bear this unpalatable fact in mind."

"Excellent," Solut Mek Kem said. "Then to solve the problem of strife between *vodranet* and proper Foitani, all modern Foitani must abandon their present distorted way of life and become as we are. As you have seen for yourselves, turning a *vodran* into a proper Foitan is easy—and no wonder, given that you are poor modifications of the true form. In a generation's time, the race can be whole again, and as it always should have been."

"I like the way I am just fine, and if any stinking *kwopil* has the brass to tell me my get or I would do better as perverts, we'll see how well he does radioactive," Vomisa W Nhoj said. Great Ones, Foitani from Odern, and Rof Golani had all installed weapons checks outside the *Harold Meeker*. Had it been otherwise, Jennifer was sure the blue-gray Foitan would have blazed away with everything he had.

Pawasar Pawasar Ras, as was the way of the Oderna, was more restrained but no less certain: "I fail to see how this proposal in any way benefits the Foitani now living within our sphere. We gain nothing from it save the commitment of the *kwopillot* not to attack. Buying safety with capitulation is always a poor bargain."

"On the contrary: you *vodranet* gain a great deal. Being as you are, you have lost the possibility for lifelong relationships between the sexes, the cornerstone of Foitani society since time immemorial," Solut Mek Kem said.

"He has something there," Jennifer whispered to Greenberg. Greenberg nodded. Maybe stable home life would be more likely to lead to a stable existence for the species than the serial relationships in which modern Foitani

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

perforce engaged. On the other hand, the Great Ones, while stable among themselves, had wreaked unmitigated havoc on every other race they met. Human notions of right and wrong were anything but universal outside humanity.

Aissur Aissur Rus said, "Perhaps, *kwopil,* we lack the characteristic you extol. Yet can your kind claim to understand our race's whole nature, as we do? We give birth and sire, nurture and conquer, all of us together. Why should we give that up? If you put the proposition to our species on any surviving world of the sphere, few would choose it."

"Then as I believed from the outset, there is no point to these talks," Solut Mek Kem said. "We will have war."

For all his ringing proclamation, for all his departing from the *Harold Meeker* and flying up to the *Vengeance*, Solut Mek Kem did not commence battle at once. Jennifer took that for a hopeful sign—with how much justification, she did not know. Trying to provide more justification, for herself and everyone else, she called the Great One. There was, she knew, a very real chance the Foitan would not deign to speak to her, she being, after all, a mere alien. In that case, though, she—and everyone else—would be no worse off than if she had not called.

As far as she could interpret Foitani expressions—which wasn't far—Solut Mek Kem was anything but delighted to get on the screen with her. But the Great One did not refuse. Again, she took that for a hopeful sign. "Thank you for being willing to listen to me," she said, wanting him to know she knew the concession was unusual.

"It is no inherent merit on your part, let me assure you." Like most Foitani, Solut Mek Kem did not waste politeness on beings outside his in-group. "My willingness, as you call it, is purely pragmatic. I am forced to recognize that the situation in which I find myself is not that which I anticipated on returning to awareness. You are part of this new situation. I will learn what I can, then act."

From a Foitan, that was a miracle of moderation; had Jennifer had to devise a motto for the Foitani, she would have come up with something like, *shoot first, then question the corpse*. She said, "I have two things I want to discuss with you. One, obviously, is the prospect of a second round of Suicide Wars."

"This, again obviously, has my interest, though many aboard *Vengeance* feel it would be worthwhile if it meant exterminating all *vodranet*."

"But isn't it as likely to result in getting rid of all you *kwopillot*, or maybe all of your species?"

"This prospect is all that has stayed our hands thus far."

"Wonderful." The Great Ones used little in the way of subterfuge. They'd had scant need of it; whatever they wanted, they'd simply taken. Jennifer could have done with more socially lubricating hypocrisy—facing up to such straightforward self-interest was daunting. She said, "The other matter has to do with the humans you hold in your data storage system."

"Here we may have room for discussion, assuming it can be completed

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

before fighting commences. As I told you before, I am indifferent to their fate," Solut Mek Kem said. "I asked you once if you wanted live copies produced for you."

"I don't think of them as copies. I think of them as humans," Jennifer answered. "I don't like the idea of their being in your hands; they aren't experimental animals."

Bernard Greenberg came up beside her. "That's right. What would you do if some other race held Foitani just to find out how they worked?"

"Destroy that race," Solut Mek Kem answered at once, his own voice as flat as the Spanglish words that came from the translator. "It has happened before. With the contemptible popguns in your vessel, however, you do not enjoy that option. You exist here on sufferance, not through strength. Remember it."

"We're here because Foitani thought we could solve a problem that baffled them, and the *Harold Meeker* is only a trading vessel, not a warship. I suggest you remember that, if you ever go into human space. We're better able to protect ourselves now than when you kidnapped those primitive ancestors of ours," Greenberg said.

Jennifer clapped her hands. From all she'd seen, matching the Foitani arrogance for arrogance was the best way to make them act in a humanly reasonable fashion. They could be made to respect power. Weakness they simply trampled.

Solut Mek Kem said, "I repeat, this matter is subject to discussion."

"Then let us come up to *Vengeance* and discuss it," Greenberg said. "I might point out that if it hadn't been for us, your ship would still be a tower and you would still be sleeping and impotent inside it." *And the war on Gilver would have only two sides, not a good potential for three,* Jennifer thought.

"A race that relies on the gratitude of others to cause them to act on its behalf is well on the way to extinction," Solut Mek Kem observed. "Nevertheless, you may come—in your own ship, not one furnished by either race of *vodranet* with which we have had the misfortune to become acquainted. Make note that I do this from considerations of my own advantage, not out of sentimentality." The screen blanked.

Greenberg called the research base: "I presume you were monitoring our call to the Great Ones's ship. They've given us permission. If you start shooting at us, it might annoy them. You don't want that, do you?" To Jennifer, he muttered under his breath, "I know damn well I don't."

The Foitani needed a couple of minutes to reply. Finally, a translated voice came back to the *Harold Meeker*: "You have our consent to undertake this mission, but you shall not under any circumstances enter into agreements binding upon Odern in any way."

"We won't, Thegun Thegun Nug," Greenberg promised.

Another pause. "One day I must learn how I am so readily identifiable."

"It's your charming personality, Thegun Thegun Nug," Greenberg said. "What else could it possibly be?"

"Undoubtedly you are correct," Thegun Thegun Nug said. "Out." Jennifer and Greenberg tried to hold it in, but they both started laughing at the same time.

Greenberg began talking with the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Harold Meeker's computer, making sure the ship was ready for space. Jennifer waited for a furious call from Vomisa W Nhoj. The Rof Golani knew how to delegate authority, however, for the furious call that came was from his aide Eugarps L Pmaked, accusing her and Greenberg of selling out to the perfidious *kwopillot* and threatening to shoot them down if they took off.

"If you do that, you risk starting the war with the Great Ones again," Jennifer pointed out. "Not only that, you might antagonize the Foitani from Odern. Besides, we're just humans, remember? Do you expect any self-respecting Foitani to take seriously anything we say?"

"Probably not," Eugarps L Pmaked admitted, "nor do you deserve serious regard."

"Thank you so much, Eugarps L Pmaked," Jennifer said. "Out."

"You're getting to be able to handle them pretty well," Greenberg said.

"Bernard, I don't think that's necessarily a compliment. I just want to get into space again."

"Me, too. Stuck on the surface of Gilver like this, I've felt like a bug with a shoe poised over it. Once I'm flying on my own power, at least I'll have the illusion of being a free agent again, even if I'll still be under the guns of *Vengeance*."

The *Harold Meeker* lifted off a few minutes later. Jennifer watched the Foitani research base fall away. The screen's view expanded to pick up the Great Unknown. The precinct looked strange and incomplete without the central tower: as if all roads led, not to Rome, but to nowhere.

The sky quickly darkened toward black. Stars came out. Jennifer looked at the radar pickup. On the way in to Gilver, it had shown a hideously jumbled swarm of ships and missiles, their tracks and signals jammed to provide them the greatest possible protection. Now only one artificial object swung in space near Gilver: the *Vengeance*. On radar, it was only the palest of flickering ghosts.

"I'm just glad to see it at all," Greenberg said when Jennifer remarked on that. "If we couldn't pick it up, that would be bad news for human space."

A Great One sent a peremptory signal: "Approach slowly and directly, or you will be destroyed without further warning."

Jennifer acknowledged, then shut down the communicator and sighed. "They're such a charming race. I don't know what those poor Cro-Magnon people will do once we get them back, but we have to do it. The more I think, the more it looks like I couldn't live with myself if I just left them there in that Foitani data base."

"I know what you mean," Greenberg answered. "At first, I didn't worry too much about it—they were in storage and weren't aware of anything that happened around them. But if the Foitani can call them up again and again, do what they want with them every time—test them to destruction if they've a mind to, which they probably do—I think we have to get a live copy back, and get the Great Ones to wipe the files so they can't make any more."

"Sounds good to me," Jennifer agreed. She didn't know what sort of deal they would have to make with the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Great Ones to accomplish that. Whatever it was, this price needed paying. Sometimes profit didn't count for everything.

The *Vengeance* might have been more or less invisible to radar, but before long it showed up visually in the *Harold Meeker*'s forward screen. It looked even bigger alone in space than attached to a planet . . . and no wonder. It wasn't the size of a spacecraft. It was the size of a baby asteroid—maybe even a toddler asteroid. It also bristled with weapons emplacements that hadn't been visible while it slept away the centuries on Gilver.

What worried Jennifer most was that the *Vengeance* was an artifact from the side that had lost the Suicide Wars. What sort of craft had the winners used? Whatever the answer, those ships were gone now, either destroyed in the war or turned on one another afterwards. The *Vengeance* remained, huge and deadly and all alone, as if a last *Tyrannosaurus rex* had somehow been raised from the grave and turned loose in the jungle parks of modern Earth.

The abrupt voice came out of the speaker again: "Berth your vessel at the lock with the flashing amber light, non-Foitani."

Jennifer looked in the screen. The flashing amber light seemed bright enough to be visible down on Gilver, let alone from just a couple of kilometers away. She said, "They aren't crediting us with a whole lot of brains."

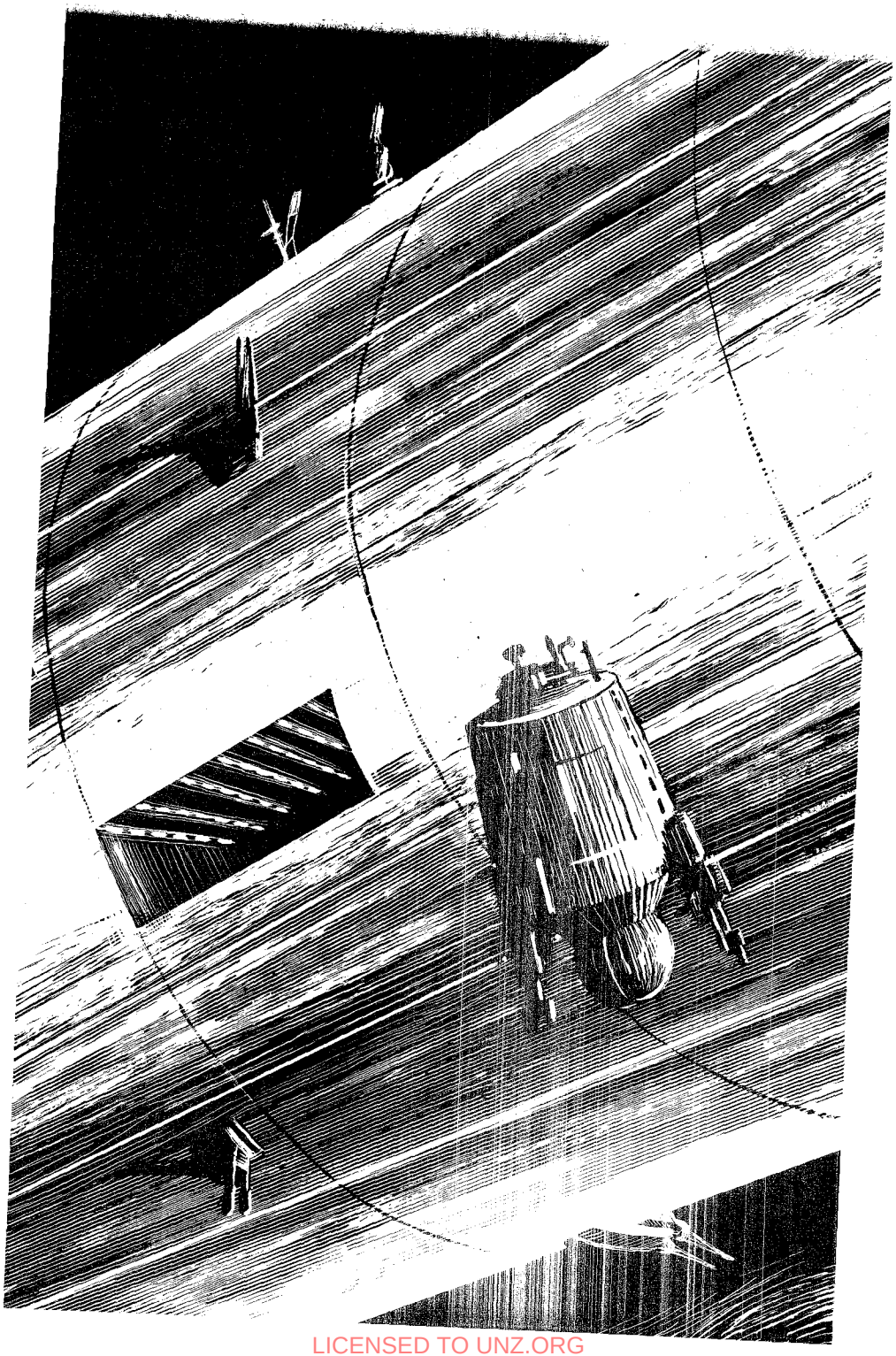
"We aren't Foitani. How could we have brains?" Greenberg answered. "They're giving us more credit than they think we deserve just by talking with us. For that matter, how smart are we? Here we are, going to dicker for specimens from our own race and for a way to keep the Suicide Wars from starting over, and what can we offer? What do we have that the Great Ones might want?"

It was a good question. Jennifer would have admired it more had she had a good answer for it. She rocked back and forth in her seat, not so much concentrating as trying to relax and let her subconscious come up with one. In SF novels, inspiration was usually enough to let the hero make the story come out right.

Inspiration did not come. In any case, inspiration looked puny when set in the balance against the kilometers of deadliness of the *Vengeance*. A mammal in the jungle park might be more inspired than any *Tyrannosaurus rex* ever hatched, but that wouldn't keep it from getting eaten if the dinosaur decided to open his mouth and gulp.

A human in the jungle park, of course, would think about a weapon to use against a monster dinosaur. Put a character from a John Campbell novel in that park and he would think of a weapon one day, build it the next, and eat *Tyrannosaurus* steak the day after that. The spacegoing *Tyrannosaurus* now engulfing the *Harold Meeker*, unfortunately, had already thought of more weapons than any John Campbell character ever born. The Foitani, whether ancient or modern, put a lot of effort into destructive capacity. If only they'd expended even a little more on learning how to get along with one another, they would have been much nicer people . . . and Jennifer wouldn't be coming aboard a spacecraft called *Vengeance*.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"If only . . . " Jennifer sighed. That was one of the ways old-time SF writers had gone about building a story. She wished it had more bearing in the real world.

The communicator spoke: "You may now exit your ship. You will find atmospheric pressure and temperature maintained at a level suitable for your species; at least, the specimens of your kind in our data store take no harm of it."

Jennifer's hands curled into fists. Those poor cave people were getting the guinea pig treatment again, and then being—what? Killed? Just erased? She thought of the explorer in *Rogue Moon*, who died again and again as he worked his way through the alien artifact on the Moon. She wondered if, like him, the Cro-Magnons in the Foitani data banks remembered each brief incarnation, each death. She hoped not.

"Atmospheric analysis," Greenberg told the *Harold Meeker*'s computer. It too reported that the air was good. Greenberg said, "I don't trust the Foitani any further than I have to." He shook his head, cocked a wry eyebrow. "If they do want to kill us, I guess they could manage it a lot more directly than lying about the air outside."

"I don't blame you for not trusting them," Jennifer said. "I don't, either. And they have something we want, too. I only wish we had something they needed."

"A way for them to live in peace no matter whom they go to bed with would be nice. You don't happen to have one anywhere concealed about your person, do you?"

"Let me look." Jennifer checked a pocket in her coveralls, then mournfully shook her head. Greenberg snorted. Jennifer said, "Shall we go see if we can get our own remote ancestors out of their clutches—and maybe even ourselves, too?"

"That would be nice," Greenberg said. He and Jennifer went through the airlock one after the other. They peered around. The *Vengeance* was so big that Jennifer didn't feel as if she was on a spacecraft; it was more as if the *Harold Meeker* had inadvertently landed in the middle of a good-sized town.

A green-blue Foitan with a hand weapon stood waiting for them. Jennifer was tired of aliens ordering her around with jerks of a gun barrel. It didn't stop happening just because she was tired of it. The Great One led her and Greenberg to a blank metal wall. He rapped on it. A door into a small chamber opened. He chivied the two humans inside, rapped on the wall again. The door disappeared, in the way Foitani doors had a habit of doing.

The guard spoke to the air. "The offices of Solut Mek Kem," the translator said. Jennifer felt no motion, but when the Foitan opened the doorway again, the small chamber was not where it had been.

Solut Mek Kem stood waiting. "Well, creatures, shall we get to the dickering?" he said. "What can you offer that might persuade us to give you copies of these other creatures of your kind, now maintained in our data store?"

"That's not all we want," Jennifer said. "Once we have these—copies—we also want you to erase the archetypes of the humans you have in your data bank, as long as you can do that without

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

causing them any pain. Can you do that?''

''Yes, we can, but why should we?'' Solut Mek Kem said. ''I repeat, what will you give in exchange for this service? Be quick. I am not in the habit of bargaining with creatures. Were it not for the service you rendered in slowing the outbreak of a combat whose result is uncertain, I would not waste my time here, I assure you.''

''Oh, I believe it,'' Jennifer said. ''Your whole species is like that. If only you were a little bit more easygoing—''

''What exactly do you want from us?'' Greenberg demanded. ''I can provide trade goods from Odern, and others of human manufacture. I can also give you information about what this part of the galaxy is like these days. Just how much, of course, is what makes a dicker.''

''These things may perhaps buy you copies of your fellow creatures,'' Solut Mek Kem said. ''They will in no way persuade me to clear out the patterns in the matrices. Your kind, evidently, is a part of the galaxy about which we shall require a good deal of information. If you expect us to forgo it, you will have to do better.''

''I've told you what we have,'' Greenberg said slowly.

Jennifer felt her face twist into a scowl. She didn't want to leave any vestiges of the Cro-Magnons in Foitani hands. ''What would it take?'' she said. ''Do you want us to tell you how to live in peace with all the modern Foitani, who'd like nothing more than seeing ever last one of you dead?''

''If you can tell us how to live in peace with *vodranet*, creature, you will have earned what you seek.''

Jennifer looked down at her shoes. If only she were a Middle English SF hero, the answer to that question would have been on the tip of her tongue. Would Miles Vorkosigan or Dominic Flandry just have stood there with nothing to say? ''If only . . . '' she said softly, and then, a moment later, more than a little surprised, ''Well, maybe I can.''

''Go ahead, then, creature,'' Solut Mek Kem said. ''Tell me how I shall live in peace with beings for whom I have an instinctive antipathy. Instruct me. I shall be fascinated to imbibe of your wisdom.'' The *kwopil* used irony like a bludgeon.

''Actually, I can't specifically tell you how,'' Jennifer said. ''But maybe, just maybe, I can tell you a way to go about finding the answer for yourselves, if you really want to.'' That was the rub, and she knew it. If *kwopillot* and *vodranet* wanted to fight, they would, and good intentions would only get in the way.

''Say on,'' Solut Mek Kem said, not revealing his thoughts.

''All right. You know by now that the Foitani from Odern brought humans—my people—to Odern because by themselves they couldn't safely enter what they called the Great Unknown—the area around your ship.''

''We made sure prying *vodranet* would not be able to disturb us, yes.''

''Fine,'' Jennifer said. ''The reason the Foitani from Odern got me in particular is that I'm an expert in an old form of literature among my people, a form called science fiction. This was a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

literature that, in its purest form, extrapolated either from possible events deliberately taken to extremes or from premises known to be impossible, and speculated on what might happen if those impossible premises were in fact true.''

Solut Mek Kem's ears twitched. ''Why should I care if creatures choose to spend their lives deliberately speculating on the impossible? It strikes me as a waste of time, but with sub-Foitani creatures, the waste is minimal.''

''It's not the way you're making it sound,'' Jennifer said. ''Look—you know about military contingency plans, don't you?''

''Certainly,'' Solut Mek Kem said.

''I thought you would. If you're like humans at all, you make those plans even for cases you don't expect to happen. Sometimes you can learn things from those improbable plans, too, even if you don't directly use them. Am I right or wrong?''

''You are correct. How could you not be, in this instance? Of course data may be relevant in configurations other than the ones in which they are first envisioned. Any race with the minimal intelligence necessary to devise data base software learns the truth of this.''

''Whatever you say, Solut Mek Kem. Do me one more favor, if you would: give me the connotations of the word this translator program uses to translate the word 'fiction.' ''

The Great One paused before answering, ''It means something like, 'tales for nestlings' ears.' Another synonym might be, 'nonsense stories.' ''

Jennifer nodded. A lot of races thought that way. With some, the only translation for ''fiction'' was ''lying.'' She said, ''We use fiction for more things than the Foitani do, Solut Mek Kem. We use tales that we know to be false to entertain, yes, but also to cast light on true aspects of our characters and to help us gain insight into ourselves.''

''And so?'' Solut Mek Kem said. ''What possible relevance does a creature's insight into itself have to the truly serious issue of *vodranet*?''

''Bear with me,'' Jennifer said. ''More than a thousand years ago, back when humans were just starting to develop a technological society, they also developed the subform of fiction called science fiction.''

''This strikes me as a contradiction in terms,'' Solut Mek Kem observed. ''How can one have a nonsense story based on science?''

''Science fiction doesn't produce nonsense stories,'' Jennifer said, reflecting that Solut Mek Kem sounded like some of the contemporary critics of the genre. ''It's sort of a fictional analogue of what you do when you develop a contingency plan. Conceive of it as a method for making thought experiments and projections when you don't have hard data, but need to substitute imagination instead. You *kwopillot* don't have hard data about living with *vodranet,* for instance; all you know is how to go about killing each other. You need all the imagination you can find, and you need a way to focus it. If imagination is light, think of the techniques of science fiction as a lens.''

''I think of this entire line of talk as a waste of time,'' Solut Mek Kem said.

''Let me tell you this, then,'' Jennifer said quickly, before he could irrevoca-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

bly reject her: "The Foitani from Odern sought me out and brought me here specifically because I'm an expert in this kind of fiction."

"The foibles of *vodranet* are not a recommendation," Solut Mek Kem said, and she was sure she had lost.

But Bernard Greenberg said, "Consider results, Solut Mek Kem. Before Jennifer got here, you had been dormant for 28,000 years. The Foitani from Odern weren't close to getting into the Great Unknown, let alone into the *Vengeance*, by themselves. Look at all that's happened since Jennifer came to Gilver."

Jennifer put her hand on Greenberg's arm. It was completely in character for him to minimize his own role in everything that had happened so the deal could go forward.

Solut Mek Kem opened his mouth, closed it again. Greenberg had managed to make him thoughtful, at any rate. At last the Great One said, "An argument from results is always the most difficult to confute. Very well; let me examine some samples of this alleged science fiction. If I think expertise in it might prove of some value to the present situation, I shall meet the terms you have set: copies of the creatures of your kind in our data stores, with the originals to be deleted."

Jennifer clenched her teeth. *Put up or shut up*, she thought. While she tried to decide which stories Solut Mek Kem ought to judge, she said, "May I please call Aissur Aissur Rus at the research base of the Foitani from Odern? He has a program that translates between your language and the one in which the stories were composed, one which we humans no longer speak."

"First scientific nonsense or nonsense science, I know not which. Now you haul in the *vodranet*," Solut Mek Kem grumbled. "Do what you think necessary, creature. Having stooped so low as to negotiate with sub-Foitani, how could *vodranet* befoul me further? Speak—your words are being transmitted as you require."

"Aissur Aissur Rus?" Jennifer said. "Are you there?"

The reply came from nowhere: "That is a translator's voice, so you must be a human. Which are you, and what do you need?"

"I'm Jennifer," Jennifer said. "Can you transmit to the *Vengeance* the program you used back on Saugus to read Middle English science fiction? You thought someone who knew it might be able to give you insights on the Great Unknown. Now the Great Ones hope its techniques may help them figure out how not to fight the next round of the Suicide Wars." She knew she was exaggerating the Great Ones's expectations, but no more than she would have in arranging a deal of much smaller magnitude.

"I will send the program," Aissur Aissur Rus said. "I would be intrigued to learn the Great Ones's opinion of this curious human discipline."

"You aren't the only one," Jennifer said.

Solut Mek Kem turned to glance at something—evidently a telltale, for after a moment he said, "Very well. We have received this program. On what material shall we make use of it?"

"I've been thinking about that," Jen-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

nifer said. "I'm going to give you three pieces. You know or can learn that humans are of two sexes, which we keep throughout life, just as you do. *The Left Hand of Darkness* speculates on the consequences of discovering a world of humans genetically engineered to be hermaphrodites."

"That is not precisely similar to our case, but I can see how it might be relevant," Solut Mek Kem said. "It is not the sort of topic about which we would produce fiction."

"Species differ," Jennifer said. Mentally, she added, *You might know more about that if you hadn't gone around slaughtering all the aliens you came across.*

"You spoke of three works," Solut Mek Kem said. "What are the other two?"

"One is 'The Marching Morons,' which looks at the possible genetic consequences of some of the social policies in vogue in the author's day. The events it describes did not happen. Kornbluth, the author, didn't expect them to, I'm certain. He was using them to comment on his own society's customs, which is something science fiction did very effectively."

She waited for Solut Mek Kem to say something, but he just looked at her with those dark green eyes. She went on, "The third story is called 'Hawk among the Sparrows.' It warns of the problems someone used to a high technology may encounter in a place where that technology cannot be reproduced."

"Yes, that is relevant to us," Solut Mek Kem said. "Again, it is not a topic we would choose for fiction. I will consider these works. I will consider also the mind-set which informs them, which I gather to be the essence of what you seek to offer me."

"Exactly," Jennifer said, more than a little relieved the Great One understood what she was selling.

"Enough, then. You are dismissed. I shall communicate with you again when I have weighed these documents. You would be well advised to remain in your ship until that time, lest you be destroyed by one of my fellows who has less patience with vermin than I do. The guard here will escort you."

Jennifer fumed all the way back to the *Harold Meeker*. The worst of it was that she knew Solut Mek Kem had been trying to help. The Great Ones simply had no idea how to deal with any beings unlike themselves. No wonder they had started fighting when the split between *kwopillot* and *vodranet* developed among them, and no wonder they kept fighting until they could fight no more.

The only glimpses she got of *Vengeance* were of the open area around the *Harold Meeker*, which she'd already seen. Just a handful of Foitani beside her guard saw her, which she soon decided was just as well. By the way they automatically took a couple of steps toward her, she was sure they would have attacked if the guard had not been with her. They probably assumed she and Greenberg were prisoners. By the way the guard acted, that was what he thought. She didn't care to find out what would happen if she tried going in the wrong direction.

The quiet hiss of the airlock gaskets sealing made her sag with relief. Logically, it shouldn't have mattered. She was just as much in the power of the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Great Ones inside the *Harold Meeker* as she had been outside. But logic had little to do with it. The barrier looked and felt strong, no matter how flimsy it was in fact.

"I have a question for you," Greenberg said. "Suppose you do manage to convince the old-time Foitani you've given them a way to work out how to exist alongside their modern cousins? The modern Foitani don't have that way. You need two sides to have peace, but one is plenty to start a war."

"You're right." She paced back and forth, as best she could in the cramped crew compartment. "I'll call Aissur Aissur Rus again. He's had some actual experience working with the concepts I'm selling. If anyone can interest the others in them, he's the one."

"Not Vomisa W Nhoj?" Greenberg asked slyly.

She rolled her eyes. "No, thanks."

As it happened, Aissur Aissur Rus called her first. She explained to him the deal she had put to the Great Ones, knowing all the while that Solut Mek Kem or one of his aides was surely listening in. She finished, "You were the one among your people who thought someone used to the ideas of science fiction would be able to help you on Gilver, and you turned out to be right. Do you think that you modern Foitani can apply this same sort of creative extrapolation to the problem of living with *kwopillot*?"

"That is—an intriguing question," Aissur Aissur Rus said slowly. "If the answer proves to be affirmative, its originator would surely derive much credit therefrom." You *would derive that credit, you mean*, Jennifer thought. Aissur Aissur Rus continued, "If on the other hand the answer is in the negative, the Suicide Wars begin again shortly afterwards, at which point no blame is likely to accrue, for who would survive to lay blame?"

"Then shall I send you the same materials I gave to Solut Mek Kem?" Jennifer asked. "Maybe you can use them, if not to change Pawasar Pawasar Ras's mind, then at least to open it a little bit."

"What materials did you furnish to the Great One?" Aissur Aissur Rus asked. Jennifer told him. He said, "I presently have all of those, I believe, save 'Hawk among the Sparrows.' We kidnapped you before you gained the opportunity to discuss the literary pitfalls of overreliance upon advanced technology. Though alien, I find them most intriguing documents. 'The Marching Morons' presents a quite Foitani-like view of what constitutes proper behavior under difficult circumstances—not that we would ever have permitted culls to breed as they did to establish that story's background."

"Aissur Aissur Rus, I'm convinced you would have gotten an 'A' in my course," Jennifer said.

"So you have said, human Jennifer. I shall take this for a compliment. My people have said repeatedly, in talks you have heard and in many more conversations where you were not present, that they could not imagine how they were to live with *kwopillot*. I still cannot imagine how we are to accomplish this. Nevertheless, perhaps you have furnished us a tool wherewith to focus our imagination more sharply on the prob-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

lem. If this be so, all Foitani will be in your debt."

"That's not something you ought to tell a trader, you know," Jennifer said.

"Possibly not. Nevertheless, you are at present in no position to exploit my words. Will you send 'Hawk among the Sparrows' to me now?"

Jennifer fed the piece into the computer for transmission to Gilver. She remarked, "You know, Aissur Aissur Rus, you may end up as Odern's ambassador to the Great Ones if you do manage not to fight. You're better with strange peoples than any other Foitan I've met. Thegun Thegun Nug, for instance, would have ordered me to send him that story just now, instead of asking for it."

"He is an able male," Aissur Aissur Rus said stoutly.

"Have it your way," Jennifer said. "Out." She turned to Greenberg. "Now we wait to see what the Great Ones have to say."

"I hope we don't wait too long," he answered. "I'd be willing to bet Odern's fleet is already heading this way, and I have no idea how far from Gilver Rof Golan is. For once, I wouldn't mind if the communicator interrupted us."

"Is that a hint?"

"You know a better way to pass the time?" Greenberg asked.

"Now that you mention it, no," Jennifer said. The communicator did not interrupt them. Like Greenberg, Jennifer almost wished it would have.

"You will report to me at once," Solut Mek Kem said, as abrupt as if he'd been Thegun Thegun Nug. Jennifer and Greenberg traded worried glances as they hurried out through the airlock. The communicator had been silent for thirty-six hours before that sharp order. Solut Mek Kem knew what he thought of the works Jennifer had given him. Whatever it was, he wasn't letting on.

A Foitani guard waited outside the *Harold Meeker*. Jennifer could not tell if it was the same one who had escorted her to Solut Mek Kem before. The guard said nothing and gave no clues, merely gesturing *come along* with his hand weapon. One of the nice things about human worlds, she thought, was that sometimes whole weeks went by without anyone pointing a gun at you.

She also could not tell if she and Greenberg went by way of the same moving chamber as they had the last time; one blank room looked much like another. Solut Mek Kem was definitely in the same office he had occupied before. The company he kept there, however, was a good deal different.

Some sort of invisible screen—possibly material, possibly not—kept the Cro-Magnon man and woman from either running away or attacking the Foitan. The two human specimens turned fierce, frightened faces on Jennifer and Greenbert as the guard led them into the chamber. They shouted something in a tongue as dead as the woolly mammoth.

"You have won your wager," Solut Mek Kem said. "The concept of extrapolation mixed with entertainment is not one we developed for ourselves, yet its uses quickly become obvious as we grow acquainted with it. I wonder how many other interesting concepts we have exterminated along with the races that created them." Jennifer had not imagined a Foitan could feel guilt. A moment

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

later, Solut Mek Kem abused her of her anthropocentrism, for he said, "Well, no matter. They are gone, and I shall not worry about them. The masters of these creatures" —he stuck out his tongue at the Cro-Magnon couple— "are also now gone from our data store; I keep my bargains. The copies are yours to do with as you will."

Jennifer started to ask if there was any way for her to check that, then held her tongue. If the Great Ones wanted to cheat, they could; how was she supposed to thread her way through their data storage system? Besides, questioning Solut Mek Kem was liable to make him angry, and at the moment he was about as well-disposed as a Foitan could be toward members of another species.

Instead of complaining to him, she turned to Greenberg: "I suppose the kindest thing we can do for these poor people is stun them and put them out of their sensory overload before they scare themselves to death." She wasn't sure she was exaggerating; half-remembered tales of primitive humans said they might do just that.

The translator carried her words to Solut Mek Kem. "I will take care of it for you," the Great One said. He rapped on the wall behind him to expose a cavity. From it he took a weapon smaller than the one the Foitani guard carried. He started to point it at the two reconstituted humans.

"Wait," Jennifer said quickly. She didn't know whether the Great Ones used the same stun beam as modern Foitani, but if they did, the Cro-Magnons wouldn't like waking up from it. She drew her own stunner from a coverall pocket, turned it on the man and woman from out of time. They slumped bonelessly to the floor.

"Let's take them back to the ship and get them into cold sleep," Greenberg said. "I don't want them awake in there and bouncing off the walls."

"Sounds good to me," Jennifer said. She spoke for the first time to the guard: "Honored Great One, could you please carry these humans to our ship? With your great size and strength, you can easily take them both at once."

Flattery got her nowhere. The guard said one word: "No."

She appealed to Solut Mek Kem. She got four words from him: "No. Carry your own."

She and Greenberg went over to the Cro-Magnon couple. Whatever had kept them in their corner of the room didn't keep the traders out. Greenberg grabbed the unconscious man by his shoulders. Jennifer took hold of his ankles. He was hairy, scarred, flea-bitten, and smelly. He seemed to weigh a ton, and Jennifer was sure he would only get heavier as she toted him.

"Let's go," Greenberg grunted. Neither of them had much practice at hauling what was in essence a dead weight. Having the Foitani guard alongside watching did nothing to make matters easier. Getting the limp Cro-Magnon into and through the cramped airlock of the *Harold Meeker* was a separate wrestling match in itself. Breathing hard, Greenberg said, "Give him another dose, Jennifer. We want to make sure he's out until we can bring his mate back."

"Right," Jennifer said. Thinking of all the trouble a primitive who woke up too soon could get into on a starship was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

enough to make her blood run cold and then some.

After the man was sent into deeper unconsciousness, she and Greenberg went back for the woman. She was just as dirty and smelly and fleabitten as her companion, but, fortunately, a good deal lighter. Greenberg once again handled the head end. "You know," he said, looking down at his burden, "clean her up a little—well, a lot—and she might be pretty."

"Maybe," Jennifer said. "So what?"

"It makes life easier." After a few steps, Greenberg noticed Jennifer hadn't answered. "Doesn't it?" he asked.

"A lot of the time, all it does is make things more complicated," she said. She thought about it for a few more steps, then added, "This one, though, will need all the help she can get. For her, I suppose, being pretty really is going to be an asset instead of a nuisance."

The woman was starting to wiggle and moan by the time they got to the *Harold Meeker*. Greenberg stunned her again before he and Jennifer hauled her through the airlock. He said, "Let's put them into cold sleep as fast as we can, before they start getting frisky again."

The cold sleep process was designed to go fast, so it could be activated in case of a sudden emergency aboard ship. As Jennifer hooked the male of the pair up to the system, she said, "What *are* they going to do when we get them back to human space? Nobody's had to deal with human primitives for hundreds of years; it must be a lost art."

"I haven't the slightest idea what they'll do," Greenberg answered. "I'm not going to worry about it, either. Whatever it is, it has to be better than experimental animals for the Foitani."

"You're right about that," Jennifer said. Just as she was connecting the nerve retarder net, the communicator chimed. "No, damn it, not now," she shouted at it. "We're not even screwing!"

The communicator ignored her. The words that came from it were more like snarls than speech. The translator turned them into flat Spanglish: "Answer me, you pestilential sub-Foitani creatures. When Vomisa W Nhoj deigns to speak with you, you are to take it as a privilege."

"Oh, shut up for a minute," Jennifer said, enjoying the license given her by a good many thousand kilometers of empty space between herself and the Rof Golani warleader. When the Cro-Magnons's pod retreated into its storage bay, she decided to notice the communicator again. "Now, what is it you want, Vomisa W Nhoj?"

"Whatever documents you have passed on to the Oderna and the *kwop-illot*," Vomisa W Nhoj answered.

"Oh," Jennifer said. "Yes, I can do that. I would have done it sooner, but it never occurred to me that you might want them, Vomisa W Nhoj. You haven't shown much use for humans, you know." *You haven't shown much use for anything, you know*, she added mentally.

The warleader said, "If my potential allies and my enemies have these data, I should be privy to them as well. Explain to me why the Oderna and *kwop-illot* are interested in these long effusions by sub-Foitani."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"I love you too, Vomisa W Nhoj," Jennifer said sweetly. But the more minds trying to avoid a new round of Suicide Wars, the better, so she did explain to the warleader the concept of science fiction and its potential application here. Vomisa W Nhoj was vicious, but not stupid. Jennifer finished, "The books and stories are examples intended to turn your thinking in the appropriate direction."

Vomisa W Nhoj remained silent for some time after she was through. At last, he said, "This new concept will have to be analyzed. We on Rof Golan write and declaim sagas of great warriors of the past, but have nothing to do with the set of organized lies you term fiction, still less with using it as if it were fact."

"Let me know what you think when you've looked at the documents," Jennifer said. "You might also want to talk to Aissur Aissur Rus. He comes fairly close to being able to grasp another race's point of view."

Vomisa W Nhoj switched off without replying—typical Foitani manners, Jennifer thought. But she remained more cheerful than otherwise. The Rof Golani hadn't dismissed the concept of trying SF techniques to extrapolate ways in which *kwopillot* and *vodranet* could live together in the same galaxy. From him, that was an excellent sign.

Greenberg said, "The primitives are down and freezing. Assuming we ever get to leave—and assuming we don't run into any more leftover weapons from the Suicide Wars—we shouldn't have any trouble getting them back to Saugus."

"Saugus? Why Saugus?" Jennifer said.

"For one thing, it's the planet you live on these days. For another, I assume the university where you're teaching is a good one." He waited for her to nod, then went on, "It ought to have some good anthropologists, then. I can't think of any people better suited to helping show our unwilling passengers how the world has changed since they were last around to look at it."

"Makes sense," Jennifer said.

"Saugus also ought to have a merchants' guild hall." Again, Greenberg waited for a nod before continuing: "In that case, I can do a couple of things. First, I can recommend you for master status." He held up a hand to forestall whatever she might say. "You've earned it, you ought to have it, and you're going to get it. If we do manage to get out of this mess, it'll be thanks to your expertise. And we'll show a profit, and a good-sized one. You qualify."

"All right." The only thing Jennifer really wanted was to get back to teaching and research, but she'd learned having something else to fall back on could come in handy. She said, "That's one thing. What turns it into a couple?"

Greenberg hesitated before he answered. "The other thing I was thinking of was transferring my base of operations to Saugus. That is, if you want to turn *us* into a couple once we're back."

"Oh." She felt her face twist into a new expression as the implications of that sank in. The expression was an enormous grin. "Sure!" She hugged him.

"I don't want you to leap into this, you know," he said seriously. "I'm not

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

going to stop trading, which means we may be apart big stretches of time. And I know you'd sooner stay at the university."

She shrugged. "We'll do the best we can for as long as we can. That's all we can do—that's all anyone can do. Right now, I don't want to worry about complications, except the ones that are keeping us stuck in Foitani space."

"Sounds sensible to me," he said. "People who borrow trouble usually end up repaying it at high interest." He yawned. "I wouldn't mind going into cold sleep myself. I'm far enough behind on the regular sort that that's the only way I'm likely to catch up. Shall we try to gain on what we can?"

"When going to sleep sounds like a better idea than going to bed, does that mean the romance is starting to fade?" Jennifer asked. Greenberg had just pulled his shirt off over his head. He bunched it up and threw it at her. She tossed it aside, undressed, and settled down on her foam pad. She didn't care about romance right this second, only about how tired she was. Greenberg told the computer to turn down the lights. Sleep hit her like a bludgeon.

The communicator hauled Jennifer and Greenberg back to life after about five hours of sleep—just enough to leave them both painfully aware they needed more. A Foitani voice roared from the speaker. "Answer, humans," the translator supplied.

"What is it now, Vomisa W Nhoj?" Jennifer asked, rubbing her eyes and thinking wistfully of coffee.

"This is not Vomisa W Nhoj. This is Eugarps L Pmaked. The warleader ordered me to evaluate your concept of scientific lying."

Jennifer wondered whether the translator was hiccuping or whether Vomisa W Nhoj had given that name of the Middle English literature as he assigned it to his subordinate. That didn't really matter. "What do you think of it, Eugarps L Pmaked?"

"To my surprise, I find myself quite impressed," the Rof Golani Foitan answered. "It serves to make extrapolation palatable, and by extension even speculates logically about the consequences of known impossibilities, something I had not imagined possible."

"Then you think it might let you find a way to live with the *kwopillot* aboard the *Vengeance*?" Jennifer asked hopefully.

"It might let us look for a way," Eugarps L Pmaked said. "I take that for progress. So will the warleader Vomisa W Nhoj, since we never imagined—"

Eugarps L Pmaked's voice vanished from the speaker. A moment later, that of a different Foitan replaced it: "Humans, this is Solut Mek Kem. We have detected ships emerging from hyperdrive in this system. Your presence compromises *Vengeance*'s defenses, to say nothing of the fact that your drive energies could be used as a suicide weapon against us. You will leave immediately."

"Of course, Solut Mek Kem," Greenberg said. "I'll order the computer to—"

"Look in the viewscreen," Jennifer said. Greenberg did. His eyes got wide. There was the *Vengeance*, some kilometers away and visibly shrinking.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

When Solut Mek Kem said *immediately*, he didn't fool around.

"One of these days, I'll see if our instruments picked up any clue of how they just did that," Greenberg said. "Right now, though, I think the smartest thing to do is put as much distance between us and the *Vengeance* as we can."

Jennifer did not argue with him. The *Vengeance*, at the moment, was the biggest target in the Gilver system. No, the second biggest—Gilver itself was still down there. "Can we monitor traffic between the ship and the ground?" she asked.

"Good idea," Greenberg said.

The first signal the *Harold Meeker* picked up was almost strong enough to overload its receiver: "Solut Mek Kem aboard *Vengeance,* calling the base on Gilver. We will act for our own defense only for a period of two rotations of Gilver, in which time you are to persuade your newly arrived ships to break off combat so that we and your leaders may extrapolate ways in which we need not destroy each other. If they continue to attack thereafter, we shall fight as we see fit. Be informed and be warned."

"We did it!" Jennifer exclaimed.

"We may have done it," Greenberg said, less optimistically. "Let's see what Pawasar Pawasar Ras thinks of the offer."

The answer was not long in coming. "Incoming Foitani fleet, hold your fire," Pawasar Pawasar Ras said. "This is Pawasar Pawasar Ras on Gilver. I speak without coercion of any sort. Know that the Suicide Wars arose out of conflict between our sort of Foitani and *kwopillot*. Know also that if we and they fail to come to terms now, the Suicide Wars will return; Earthgrip will hold sway over us all, and it shall be as if our race had never existed. Let us talk and explore other ways before we fight."

A louder, shriller voice followed that of Pawasar Pawasar Ras: "I, Vomisa W Nhoj, warleader of Rof Golan, declare the time for fighting is not yet—and who would dare coerce a warleader? Hear me and obey, my brethren of Rof Golan!"

"Do you think they'll listen?" Jennifer asked.

"I don't know." Greenberg glanced toward the radar. So did Jennifer. The screen was full of ships. All of them were headed straight toward Gilver, or rather toward the *Vengeance*, which hung above the planet in a synchronous orbit that held it right above the precinct of the Great Unknown—and the Foitani research station. He looked at the radar plot again, shook his head. "I don't intend to wait around and find out, either. Computer, initiate hyperdrive acceleration sequence, vector exactly opposite that of those approaching ships."

"Initiating," the computer said.

If Greenberg had hoped to sneak out of the brewing fight while no one was paying attention to the *Harold Meeker*, that hope lasted less than a minute. A Foitani voice came from the communicator: "Human ship, this is Solut Mek Kem. Why are you abandoning this solar system? Answer immediately or face the consequences."

When a Foitan said *face the consequences*, he meant *dig your grave and jump in*. Greenberg said, "When you pushed us away from your ship, Solut

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Mek Kem, you left us sitting right next door to you as the modern Foitani head in on an attack run. We can't defend ourselves; this is a trader, not a warship. This isn't our war, anyhow. If you were in our position, what would you do?"

"Extrapolate, please," Jennifer added, knowing the only way Foitani usually put on other people's shoes was after those other people had no further use for them.

No answer came from Solut Mek Kem. Jennifer found she was grinding her teeth, made herself stop, found she was grinding them again. *Vengeance* could swat the *Harold Meeker* out of the sky like a man swatting a gnat.

"Weapon homing!" the computer shrieked.

"It's not the *Vengeance*," Greenberg said after a quick look at the radar tank. "It's from one of the ships that just came into the system."

"Can we get into hyperdrive before it catches us?" Jennifer asked.

"No," he and the computer replied at the same time.

Jennifer went over to the radar tank, watched the missile close. Others trailed it, but they did not count; the *Harold Meeker* would hit hyperdrive kicking velocity before they reached it. That first one, though . . . some Foitani pilot, not knowing what the fleeing ship was, had been fast on the trigger. Too fast.

Then, without warning, the missile ceased to be. Greenberg shouted and pounded his fist against his thigh. "Human ship *Harold Meeker* to *Vengeance*," Jennifer said: "Thank you." Still no answer came. Less than half a minute later, the *Harold Meeker* flashed into hyperdrive.

* * *

Snow clung to the ground wherever there was shadow. The distant mountains were cloaked in white halfway down from their peaks; a glacier came forth from them onto the nearer plains like a frozen tongue sticking out. Musk oxen and the larger dots that were mammoths moved slowly across those plains.

Jennifer shivered. The synthetic furs and hides she was wearing were not as warm as the real things. Her arms were bare; gooseflesh prickled up on them as she watched. Her breath came smoky from her nostrils. "They'd better hurry up, before I freeze to death," she said, making a miniature fogbank around her head with the words.

"Maybe there's such a thing as too much realism," Greenberg agreed through chattering teeth.

On the ground a few paces away from them lay the two humans they had brought back from the Foitani sphere. The Cro-Magnons were just on the point of coming out of cold sleep. The anthropologists at Saugus Central University had gone to a good deal of effort to make them as homelike an environment as possible in which to awaken. Putting the temperature somewhere below freezing struck Jennifer as excessive. Still, in trying to bridge the gap between Pleistocene and starship, who could say what detail might prove crucial?

The woman stirred. A few seconds later, so did the man. "Here we go," one of the anthropologists radioed into the little ear speakers Jennifer and Greenberg were wearing. "Remember, you people are the link between this familiar—we hope—place and what

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

they've gone through. When they see you here, they ought to get the idea that they aren't really home, or not exactly, anyway."

"We'll know soon," Jennifer answered. Getting through to the primitives was going to be as hard as any first contact with an alien race. They'd have to learn a new language from scratch; not even theoretically reconstructed *ur*-Indo-European went back as far as a quarter of the way to their time.

The man sat up first. His eyes, initially, were only on the woman. When she opened her eyes and also managed to sit, his face glowed with relief. Then he noticed Jennifer and Greenberg. He rattled off something in his extinct speech.

"Hello. We're peaceful. We hope you are, too," Greenberg said in Spanglish. He held his hands out before him, palms up, to show they were empty. That was about as old a pacific gesture as humanity knew. Nobody could be sure, though, whether it went back to the Paleolithic. Everything the Cro-Magnons did taught researchers something.

The man didn't return the gesture, but he seemed to understand what it meant. He stood up and took a couple of steps forward to put himself between the woman and Greenberg and Jennifer. Then he spoke again, this time in a questioning tone. Jennifer made what she thought was a pretty fair guess at what he was saying: *You were there in that strange place with those monsters. Now you're here. What's going on?*

"Time for that special effect we were talking about," she whispered, for the benefit of the anthropologists outside.

Without warning, a holovid projection of a Foitan sprang into being, a few meters away from the primitives. The woman let out a piercing shriek. The man shouted too, fear and fury mingling in his voice. He looked around wildly for a stone to throw.

"You!" Greenberg said in a commanding tone, stabbing out his forefinger at the alarmingly perfect image. "Go away and never come back!" He struck a pose that proclaimed he had every right to order the big blue alien around so.

The projection winked out as if it had never been. The man and woman shouted again, this time in amazement. Then they both hurried over to Greenberg, embraced him, and pounded him on the back. He staggered under the joyful blows. "They're stronger than they think," he wheezed, trying to stay upright.

"Congratulations," the anthropologist said into his and Jennifer's ears. "You are now a powerful wizard."

"Good." Greenberg turned his head. "Ah, I see the second part of the demonstration is on its way."

Four plates floated toward the humans. Each one carried a thick steak, a couple of apples, and some ripe strawberries. The primitives needed another few seconds to spot them. Then they started exclaiming all over again.

Jennifer intercepted two of the plates, Greenberg the other two. She passed one to each Cro-Magnon, then unhooked a couple of knives from her belt and handed them to the primitives, too. She drew one more for herself. Greenberg had his own. She cut a chunk from her steak, stabbed it, and lifted it to her

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mouth. Fancy manners could come later.

Neither of the humans just out of cold sleep had recognized the metal knife for what it was—they were used to tools of bone and stone. But they caught on quickly. The man grunted in wonder as the keen blade slid through the meat. He grunted again, this time happily, when the first bite went into his mouth. Jennifer knew just how he felt. After so long on Foitani kibbles, every meal of honest food was a special treat.

The primitives made the steaks vanish in short order. They inhaled the strawberries, and ate the apples cores, stems, and all. When they saw that Greenberg and Jennifer didn't want their cores, they made questioning noises and reached out for them. Getting no rebuff, they ate them, too.

"Hunter-gatherers can't afford to waste any amount of food, no matter how small," the anthropologist said.

The man kept trying the edge of the knife with his thumb. The woman said something to him, rather sharply. With obvious reluctance, he held out the knife to Jennifer. The woman held out hers.

Jennifer shook her head, made pushing noises. "No, they're yours to keep," she said.

When the primitives realized what she meant, they whooped with glee and pummeled her as they had Greenberg. The man also reached under her synthetic fur and squeezed her left breast. She knocked his hand away. He didn't try twice. She gave him points for getting the idea in a hurry.

She pointed to herself. "Jennifer," she said.

"Bernard." Greenberg did the same thing.

The man's eyes lit up. He thumped his own chest. "Nangar," he declared.

He spoke to the woman. "Loto," she said, touching herself.

"I wonder if those are names or if they just mean 'man' and 'woman,' " an anthropologist radioed to Jennifer and Greenberg. "Well, we'll find out soon enough."

Language lessons went on from there, with parts of the body and the names of things close by. Nangar seemed to have an easier time picking up Spanglish words than Loto did.

"Maybe the tribe next door spoke a different language," the anthropologist suggested. "We think men traveled more widely through a tribal range than women, so he could be more used to using different words than she is."

After a while, Nangar pointed to the distant herds (which were actually holovid projections on a not-so-distant wall). With his own speech and many gestures, he got across the idea of hunting and then feasting. He gazed confidently at Greenberg all the while. Jennifer said, "After you got rid of that Foitan, Jennifer, he figures you can do anything."

Greenberg grinned wryly. "No matter how big a wizard I am, I don't think I can put much nutrition into a projection. Maybe it's time to distract him again." He spoke as much to the waiting anthropologists as to Jennifer.

A few seconds later, a couple of them came out from behind a boulder. They wore modern cold-weather gear. Nangar and Loto drew back in alarm. "Friends," Jennifer said reassuringly.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

She went over and smiled at the newcomers, patted them on the back. So did Greenberg.

The primitives remained dubious until one of the anthropologists reached into her backpack and took out several pieces of roasted chicken. When she passed them to Loto and Nangar, she found that the way to their hearts lay through their stomachs. Although they'd eaten a good-sized meal not long before, they devoured the chicken and gnawed clean the bones the anthropologists discarded.

The woman who'd given them the treat looked faintly appalled. "The way they eat, it's a wonder they aren't two hundred kilos each."

"The fact that they aren't tells you how often—or rather, how seldom—they get the chance to eat like this," her male companion answered. She thought it over, nodded.

Seeing that friendly relations had been established between the primitives and the people whose job it would be to guide them into the modern worlds, Greenberg and Jennifer strolled casually toward the boulder from in back of which the anthropologists had emerged. Several more anthropologists waited in the doorway the boulder concealed. They greeted the two traders with almost as much enthusiasm as Nangar and Loto had shown. One of them—in the crowd, Jennifer couldn't tell which one—let his hands wander more than they might have. Whoever he was, he didn't have Nangar's excuse for bad manners—he was supposed to be civilized.

Jennifer changed back into proper clothes with more than a little relief. Greenberg was waiting in the hall outside her cubicle when she emerged. "Do you want to hang around for a while and watch them work with the Cro-Magnons?" he asked.

She shook her head. "Do you?"

"No, not really," he said. "They do want us to stay on call for a few days, though, in case they run into trouble and need our familiar faces."

"I suppose that's fair enough." Jennifer sighed. "Still, what I'd like most would be just to start picking up the threads of my normal life again.

"Normal life? What's that? I gave it up when I decided to become a trader. But I will say that the time I spent in the Foitani sphere turned out to be even further from normal than I was quite braced for myself." Greenberg smiled, set his hand on her waist. "Not that all of it was bad, not by a long shot."

Her hand covered his. "No, not all of it was bad. We wouldn't have ended up together if they hadn't kidnapped me, and I'm glad we did. But I'm a whole lot gladder to be back on a human world again, and to feel fairly sure no one's going to shoot at me or fire a missile at my ship in the next twenty minutes."

"Amen to that," he said. "All the same, I can't help wondering whether the *kwopillot* and the *vodranet* decided to talk things over or just slug it out."

"I wonder, too," Jennifer said. "Still, you did the right thing when you got us out of there. We never would have found a better chance. But I would like to know what the Foitani ended up doing. I wonder if we'll ever find out."

"Hello, dear," Ella Metchnikova said as her path crossed Jennifer's on the edge of the university campus.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"You must come over to my place before long. I have a marvelous new—well, old, I should say—drink that everyone loves. It's called a Black Russian, and you simply would not believe what drinking two or three of them will do to you."

"Set you up for a liver transplant?" Jennifer asked, not altogether in jest—some of Ella's concoctions seemed to have been invented by ancient temperance workers intent on demonstrating the evils of ethanol poisoning by horrible example.

Ella laughed heartily. Despite mixological experiments too numerous to remember, her liver was still intact —unless, of course, this was her second or third by now. She said, "They're not as bad as all that. And bring your Bernard by. Perhaps he'd be interested in the recipe as something he could trade to, ah, aliens."

To unsuspecting aliens, Jennifer thought, inserting a likely word into Ella's hesitation. Her friend meant well, though, so she said, "Maybe he would be—you never can tell. Still, I can't bring him by for a while; he set out on a trading run last week, and he won't be back for a few months."

"Really? What an—interesting —arrangement. Do you plan on, ah, consoling yourself with someone else while he's off being primitive?" Ella's eyes went big and round.

"No," Jennifer said shortly. Ella Metchnikova wanted everything to be melodramatic. Jennifer had been in the middle of enough melodrama to last her a lifetime. But however volatile Ella was, she came through in a pinch. Jennifer said, "Thanks again for putting my stuff into storage when I disappeared."

"It was only my duty, dear," Ella said grandly. "Unlike some I could name but won't—Ali Bakhtiar, for instance—I was always sure you would come back."

"There were a lot of times when I wasn't," Jennifer said. Her kidnapping and spectacular return with Nangar and Loto had given her brief media fame on Saugus; she wasn't the least bit sorry it had finally started to wear off. She and Greenberg hadn't given the snoops all the lurid details of their adventures; that would only have made getting back to the ordinary course of day to day harder.

Ella looked down at her watch. "Oh, dear, I'm late; I must fly. Call me soon, Jennifer—promise you will."

"I promise," Jennifer said. She was late, too, not a good thing to be on the first day of a new semester. Ella went on her way. Jennifer hurried across the campus. Out of the corner of her eye, she saw people stop and look at her. That had happened before the Foitani kidnapped her, too, but women gaped along with men—a legacy of having had her face in the holovid tank a lot.

Three or four male strangers waved to her. She ignored them. Now when she was happily settled with Greenberg, men who'd seen her imagined they knew her and were entitled to get familiar. She hoped such attention would die down soon. She wanted no part of it. Aside from Bernard, all she wanted was to get back to work.

Even that wouldn't be easy. Almost at a trot, she went past the building where she'd lectured before notoriety

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

came her way. No hall in that building was big enough to hold a class the size of the one she'd be teaching today. The enrollment was three times as big as she'd ever had before, which angered her more than it pleased her. She wanted students who would be interested in the material she presented, not in her as a curiosity.

She checked the time and swore. Five minutes late—that was disgraceful. But there at last lay the second biggest lecture hall Saugus Central University boasted. The rear double doors were closed, which meant all the students were already inside. She swore again. They had to be thinking unkind thoughts about her. She fairly ran toward the special faculty entrance, which let her in right behind the podium.

She dashed up the steps onto the lecturer's platform. "I'm sorry, class," she began as she got her first look at this year's crop of students. "I—"

She stopped dead. She knew she shouldn't, but she couldn't help it. Better than three-quarters of the seats in the huge chamber were occupied by Foitani—blue Foitani from Odern, gray-blue Foitani from Rof Golan, green-blue Great Ones, purple and brown and gray and even pink Foitani from worlds she'd never heard of. Hundreds of pairs of round, attentive, deeply colored eyes bored into hers.

They didn't kill each other off, she thought. *Good—I think*. She took a deep breath and started her lecture. Translators droned to turn her words into ones Foitani could understand. Somehow she got through it. "I'm sorry; I can't take questions today," she said when she was through.

She hurried out of the lecture hall, found a public phone, fed her access card into it, checked the listings. Then she made a call. A man's face appeared on the screen. "Universal Protective Services," he said. "We're the best on Saugus."

"You'd better be," she told him. ■

●Old men love to give good advice to console themselves for no longer being able to set a bad example.

François Duc de La Rochefoucauld

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Richard P. Terra

ISLANDS IN THE SKY: HUMAN EXPLORATION AND SETTLEMENT OF THE OORT CLOUD

After spreading throughout the warm, compact inner core of the Solar System, the human race will face the daunting challenge of crossing the deep ocean of space that lies between Sol and even the nearest neighboring stars. But just off shore, at the outer fringe of Sol's gravitational reach, countless small icy islands are scattered in a vast spherical archipelago reaching almost halfway to the Sun's nearest neighbors—the myriad comet nuclei of the Oort Cloud.

Human exploration and settlement of the Oort Cloud will create a new environment for a diverse array of social, economic, and biological experimentation, and that diversity may indicate the future course of the evolution of our species. The Oort Cloud will also be the proving ground for the technology of interstellar travel: these tiny, scattered islands on the periphery of the Solar System may be our first stepping stones to the stars.

Although the notion of human settlements on comet nuclei dates back to the eighteenth century, it was not until the latter part of this century that the concept began to receive serious attention. In 1972, physicist Freeman Dyson offered this challenging vision:

> It is generally considered that beyond the Sun's family of planets there is absolute emptiness extending for light-years until you come to another star. In fact it is likely that the space around the Solar System is populated by huge numbers of comets, small worlds a few miles in diameter, rich in water and other chemicals essential to life . . . comets, not planets, are the major potential habitat of life in space. [ref 1]

More recently, astronomers, biologists, sociologists, historians and design engineers have begun to subject the idea to rigorous—if somewhat speculative—scientific and engineering analysis. They have begun to explore the very real possibility of establishing human settlements in the distant reaches of the Oort Cloud, and what life might be like there.

The Oort Cloud is thought to form a vast, spherical collection of small icy bodies orbiting at enormous distances from the Sun. Although direct observational evidence is sketchy, there are sound theoretical reasons for postulating its existence.

It is generally believed that the comet nuclei in the Oort Cloud formed along with the inner Solar System about 4.6 billion years ago. In the most widely

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

accepted theories, the Solar System originated in the gravitational collapse of an immense cloud of interstellar gas and dust. As it collapsed the cloud flattened out into the classic solar nebula, a broad, fairly thin disk of material slowly rotating about the infant Sun.

Within the nebula, the gas and dust particles began to condense and clump together into small aggregates that grew slowly into larger and larger bodies, forming planets, moons, asteroids—and comets.

Most comets are thought to have formed on the outer fringe of the solar nebula, at about the same distance from Sol as Uranus and Neptune (roughly 20 to 30 Astronomical Units). The bulk composition of these two planets is close to what would be expected if a similar mass of comet nuclei were collected together into a single, planet-sized body.

In another line of evidence, most comets seem to be significantly depleted in carbon relative to the average cosmic abundance of that element. This can be interpreted as an indication that comets formed in a region of the nebula warm enough to evaporate much of the methane (CH_4) present and prevent it from condensing with the remaining gasses and dust. As expected, comets are also badly depleted in hydrogen, as are all the other bodies in the Solar System except for Jupiter, Saturn, and the Sun.

Most of these small bodies would be swept up into the growing planets, but the orbits of many others would be perturbed and altered by close encounters. An encounter with Jupiter or Saturn would most likely result in complete ejection from the Solar System into interstellar space. In the vicinity of less massive Uranus and Neptune, comet nuclei would also be perturbed into orbits far from the Sun—but not entirely beyond its gravitational reach.

Initially, the comets would orbit more or less in the same plane as the inner system, but over time the faint tug from passing stars would randomize their orbital inclinations, creating a vast, dispersed, spherical cloud of small icy bodies—the Oort Cloud, named for Dutch astronomer Jan Oort, who first postulated its existence and structure in the 1950s.

Estimates of the total number of comet nuclei in the Oort Cloud range from about 100 billion to several trillion—more than the total number of stars in the entire galaxy. Their total mass is difficult to estimate with any precision, but is probably at least equal to the mass of Earth, and may be much greater. It is thought that the original population of the Oort Cloud was about 2 trillion comets with a mass about 30 times that of Earth, but has since been depleted by escape into interstellar space and perturbation into orbits closer to the Sun, where the icy bodies evaporate after a time.

The majority of the comet nuclei in the Oort Cloud are probably distributed throughout a broad spherical shell between 40,000 and 60,000 A.U. from the Sun (although some astronomers place the density peak a bit closer, at around 25,000 A.U.). This is just shy of one light-year (64,000 A.U.). It is possible that a substantial number orbit much closer to the Sun, between 100 and 10,000 A.U., forming an inner Oort

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Cloud. Within about 10,000 A.U. of the Sun, the orbits of the comets would lie more or less in the plane of the ecliptic. Beyond that distance, the influence of passing stars is strong enough to produce the random spherical distribution of the outer Cloud. The outer periphery of the main Cloud is probably at about 100,000 A.U.—close to two light-years. The maximum dynamic limit is about 200,000 A.U., where the gravitational pull of the galactic core begins to overcome that of the Sun [see fig. 1].

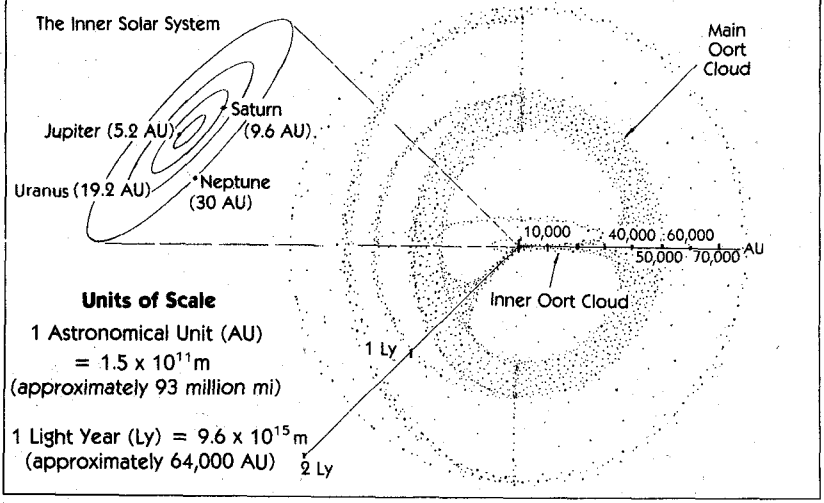
The typical separation between comet nuclei in the Oort Cloud is probably about 20 A.U.: very widely spaced indeed. In the main Cloud the orbital periods would range from one to ten million years.

Since the close encounters of Halley's Comet by Soviet and European spacecraft in 1986, a clearer picture of the nature of comet nuclei has begun to emerge. They are estimated to range in size from 0.1 to 10 kilometers in diameter and in mass from 10^{13} to 10^{19} grams—between 10 million and 10 trillion metric tons. Though small in comparison to the planets, comet nuclei still contain huge amounts of material.

Comets are thought to be made up of an extremely light, porous aggregation of the ices of various volatile elements and compounds, with a scattering of embedded dust and complex organic molecules. The ratio of dust to gas is estimated to range from 0.7 to 0.85 by mass.

The volatile component is thought to consist chiefly of water ice but also includes CO, CO_2, methane (CH_4), ammonia (NH_3) and a variety of other compounds containing oxygen, sulfur and nitrogen. The ices are thought to include a high proportion of clathrates, in which other molecules are trapped inside the lattices of the frozen gases. The grains of dust and organic material

FIGURE 1: A Schematic Representation of the OORT Cloud



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

TABLE 1

Composition of Comet Nuclei: Estimated Abundances and Distributions

A. Elemental Abundances[a]

Element	Number (%)	Mass (%)
H	43.9	4.2
C	6.7	7.7
N	2.7	3.8
O	40.2	62.5
S	1.0	3.1
Mg	1.9	4.5
Si	1.8	4.9
Fe	1.6	8.8
Ni+Cr	0.1	0.6
Al	–	0.4

B. Mass & Volume Distribution[b] of Principal Components

Component	Mass (%)	Volume (%)
Silicates	21	8.6
Carbon (graphite)	6	3.4
Very Complex Organics	19	21.0
H_2O	19	27.0
CO	10	13.0
Other	25	27.0
Other Volatiles: CO_2, CH_4, N_2, NH_3, HCN, etc.		

[a]After Delsemme, in Wilkening (ed): *Comets*, p 122. [b]After Greenberg, in Wilkening, p 157.

may be remnants of the interstellar cloud or the condensing solar nebula. A breakdown of the estimated abundances of the chief elemental and chemical constituents of a typical comet is presented in table I.

The average density of cometary material is estimated to be about 1 to 1.5 g/cm^3—close to that of water (1.0 g/cm^3). This material is thought to be a porous matrix of solid grains and larger particles, with the gaps between them filled with ice. Comet nuclei are likely to be irregular in shape, uncompacted and undifferentiated: for a body under about 10 km diameter, the force of gravity is simply too weak to affect shape or structure to any significant degree. The aggregate would have a light, very fragile structure resembling that of windblown snow. Both structure and composition are expected to be fairly homogenous throughout, although the surface layers (to a depth of perhaps 10 m) may undergo some alteration due to sublimation of ices, irradiation by cosmic rays and other radiation, and occasional sand-blasting from interstellar gas and dust.

This light fragile structure means that the resources present in the comet nuclei will be readily accessible to any human settlers. The porous mixture of dust and ice would offer little mechanical resistance, and the two components could easily be separated by the application of heat. Volatiles could be further refined through fractional distillation while the dust, which has a high content of iron and other ferrous metals, could easily be manipulated with magnetic fields. Little additional crushing or other mechanical processing of the dust would be necessary, and its fine, loose-grained structure would make it ideal for subsequent chemical processing and refining. Comet nuclei thus represent a vast reservoir of easily accessible materials: water, carbon dioxide, ammonia, methane, and a variety of metals and complex organics.

Although comets offer a huge reserve of easily accessible resources for any would-be settlers, they will be useless without a readily available supply of energy. Conditions at those distances

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

from the Sun will be bleak: the Sun will not even be the brightest star in the deep black sky, and the temperature is a bare 10 K. Making the cold, barren ice islands of the comet nuclei habitable will be a formidable task, and energy consumption is likely to be very great. Yet energy will be the scarcest resource in the Oort Cloud.

The size of any comet-based communities will be closely constrained by two factors: the availability of energy sources and the rate of energy consumption. Access to a dependable, long-term energy source will be crucial to the establishment of a viable, self-sufficient settlement. Energy consumption levels will affect both the size and complexity of the economy, the standard of living, and longevity of the community as a whole.

What are some of the potential energy sources likely to be available?

Nuclear power—fission—is unlikely. Heavy elements such as uranium will be present in only miniscule amounts, certainly not enough to form the basis for a comfortable, long-term settlement. In addition, fission processes are "dirty" in the sense that they generate a relatively high flux of radioactivity that may be undesirable.

Another potential energy source is the controlled combustion of hydrogen and oxygen, which both occur in abundance in the vast amounts of water ice that makes up about one-fifth of each comet's mass. The catch, of course, is that water must first be hydrolyzed, an energy-consuming process. Settlements closer to the Sun, say within 1,000 A.U., or those with sufficient surplus energy from other sources, may employ H_2/O_2 reaction cells for some purposes. Hydrogen combustion will probably serve as the major propellant for long-distance travel, but is unsuitable for basic power generation.

There is an alternate means of using hydrogen as an energy source—fusion. It seems reasonable to assume that the technology for fusion employing deuterium, a heavy isotope of hydrogen that fuses relatively easily, will be available by the time settlement of the Oort Court begins. Estimates of the ratio of deuterium to simple hydrogen in interstellar gases vary from about 1 in 10,000 to 1 in 100,000. Although rare, for an average-size comet this represents about 50,000 to 100,000 metric tons of deuterium.

This enormous store represents enough energy to support a population of millions for several centuries—but when the supply is gone, those millions will perish. It seems much more likely that Oort Cloud communities will choose to support much smaller populations for much greater lengths of time, husbanding their precious supply of deuterium for perhaps thousands or tens of thousands of years. They may also employ a more efficient alternative fusion pathway involving a mixture of deuterium, tritium (another hydrogen isotope), and helium to extend the lifetime of the available supply.

At some point humans may also learn how to initiate proton fusion and thereby assure a virtually unlimited supply of energy employing simple hydrogen, the most common element in the cosmos. But as yet, only the stars themselves

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

have accomplished this on a large scale.

Finally, there is one alternative renewable source of energy available: starlight. The concept of harvesting starlight to support comet-based communities was first put forward by astrophysicist Eric Jones and anthropologist Ben Finney [2 & 3]:

> In principle all one needs is a giant mirror to concentrate the thin photon stream. The mirrors would be truly gigantic. . . . At half a parsec [about 1½ light-years] from a Sun-like star the mirror would have to be about 1500 kilometers radius to collect a megawatt (roughly the size of the continental US). Practicality and common sense might well dictate a larger number of much smaller collectors [ref 3, p 362].

Jones and Finney estimate a typical medium-sized comet could supply enough aluminum for mirror surfaces to collect about 300 megawatts (MW) from starlight. If additional metals were used, this capacity could be enhanced somewhat. Jones and Finney estimated per capita power consumption at 0.6 MW, about 30 times the current US rate of 20 to 25 KW per capita; thus the typical population of a comet-based community would be about 500.

The amount of aluminum and other reflective metals in a given comet will set a definite upper limit on the area of mirror surface that can be created, and thus on the population that can be supported by collecting starlight. Comet-based communities closer to the Sun in the inner Oort Cloud will therefore enjoy a higher photon flux and will have more energy available to them, and will be able to support larger populations.

Although the energy supply will be the most important limiting factor for any comet-based settlements, there are a host of other factors that will influence the nature of their economies.

Most of these communities are likely to be small and isolated, with populations of only a few hundred. Such small economic systems are sure to face many limitations and constraints. Many types of tools, specialized pieces of equipment and expert skilled labor will all be in short supply. The economy will essentially be a closed system, especially for the more distant and isolated settlements. For many items and commodities, supply will not be related in any way to need or demand.

The members of these communities will of necessity be very dependent upon one another and are also likely to develop a strong conservation ethic; they will recycle as much as possible. Their relative isolation will encourage self-reliance and cooperation, as well as the pooling of skills, labor, and resources. Small, isolated, tightly closed economies are thus likely to be more communal in their outlook, particularly in regard to resources, power consumption, and the allocation of labor. Larger communities will probably have a wider variety of economic patterns.

Because populations are likely to be small, each individual will be of immense value to the community, representing a pool of knowledge, skills, and experiences as well as a heavy invest-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ment in training and education. It will be necessary for the settlers to become generalists; a small community will simply not have enough people to support a specialized expert in every field. Each person will have to develop a sound working knowledge in many overlapping fields, and consequently will have less time to devote to becoming expert in any one of them. Some specialties may have to be eliminated altogether in very small communities.

Many of these limitations and constraints can likely be alleviated or even eliminated with the aid of sophisticated technology. The exploration and settlement of the Oort Cloud, the establishment of viable communities in the cold deeps of space, will demand heavy reliance on many different forms of high-technology equipment. A combination of the right tools and skills to use them will be vital.

It seems unlikely that a small band of pioneers will be able to create a secure, comfortable niche in the Oort Cloud without the use of automated systems and artificial intelligence (AI). Such systems will eliminate the need for human intervention at many basic but routine levels of activity, freeing people to apply their skills where they are needed most. Computers and automated systems are skilled tools which can enhance and multiply human capabilities manyfold.

The human residents of the Oort Cloud will control and monitor the operation of a complex array of self-directed systems. Most of the basic comet-mining and materials processing operations will probably be automated. They will produce stockpiles of refined materials and, at the highest level of complexity, produce many types of finished products.

Artificially intelligent systems will also be essential to the viability of the communities, particularly for small settlements. They will rely heavily on expert systems—sophisticated computer programs that combine an extensive store of information with a powerful decision-making capability for interpreting complex data. They will operate at the level of a human expert that perhaps the community cannot support.

The human members of the community, with their generalized skills and experiences, will be capable of handling all the normal operations and events; the expert systems would serve to supplement and complete the basic suite of skills and abilities required to keep the community healthy.

Because of their dependence on AI systems, residents of the Oort communities will also need to be skilled in the manipulation and application of information. They will have access to the vast sum of human knowledge, but it will be useless to them without sophisticated information processing systems. They will have to become adept at working in cooperation with their AI systems to manage the masses of data available, to sift through it to extract what they need. The use of sophisticated computer-based systems will be a basic skill in every Oort Cloud community, and it seems likely that education will be based in large part on AI systems.

All these factors will have a number of important effects on the shape of the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

settlement's economy. The distribution of activity will be very different for any Earth-bound economic system.

The primary sector of the economy—the exploitation of natural resources—is likely to be small and almost completely automated. Human involvement will be minimal. The primary sector will consist of two basic activities: energy production and the harvesting of cometary resources. Once the appropriate systems are established, both will be relatively simply activities.

The secondary sector—the transformation of the natural resources—will include refining and processing the raw cometary feedstock, manufacturing, construction and assembly operations, agriculture and food production, and recycling. Again, many of these activities will be highly automated, but closer human supervision will be necessary to tailor these activities to the current needs of the community.

It is the tertiary sector of the economy, support services, that will engage the majority of human skill and attention. It will include operation of the utility and life support systems, maintenance and repair operations, transportation, health care, information processing, storage and retrieval, education and administration, business and commerce.

The settlers will have to choose between many different possible paths for development. Will they allow the community to grow, or should they impose controls on themselves to maintain a small population? Will they want their community to last many years at a low rate of consumption, or will they want to trade communal longevity for a higher rate of resource consumption? The outcome of these decisions will depend primarily on two factors: the available supply of resources and the standard of living that the community desires and will defend.

The average standard of living is likely to be quite comfortable, within the limits of the communities' capabilities. Because of its extreme fragility, the surface of the comet itself will be unsuitable for permanent dwellings; the habitats will probably be free-flying. Physically, they may resemble the Bernal Spheres and O'Neill Cylinders already envisioned for space-based communities in the inner Solar System. The most significant difference will be the lack of large window surfaces, since there will be no need to admit sunlight for illumination, which will allow for an increase in the usable surface area inside the habitats.

Communities lacking a large supply of deuterium or those choosing to conserve their supply would locate their habitats at the center of huge arrays of mirrors for the collection of starlight. A variety of social and economic factors suggest the members of such a community, which would number about 500, would be dispersed throughout the array in bands of about 25 persons—a dozen adult men and women and their children.

Each band would tend a mirror farm stretching across perhaps 30,000 km of space, overseeing a complex network of robots and other automated systems responsible for the routine operation and maintenance of the mirror farm. In the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

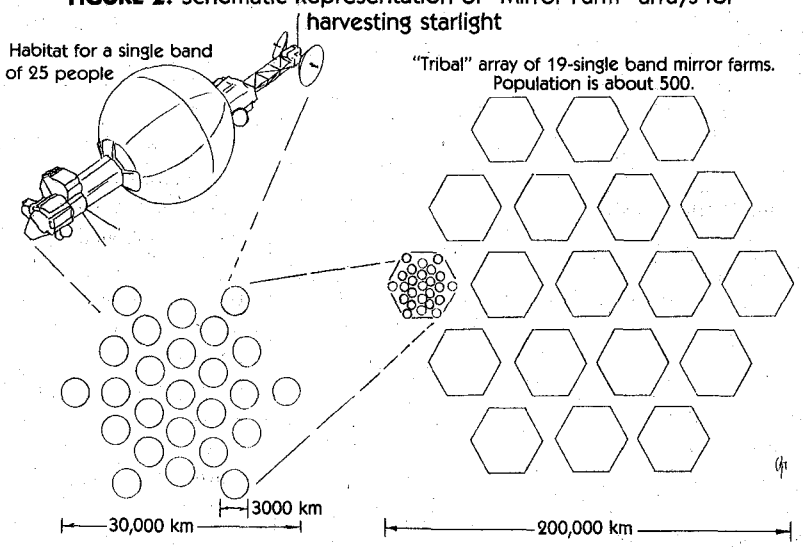
event of an emergency requiring human intervention, the settlers would need to be able to reach even the edge of the array quickly, and so will gather the mirrors in tightly packed arrangements.

The individual mirror farms of the separate bands would then be clustered into a vast array supporting the community's entire population, spread out over 150,000 to 200,000 km of space: an immense surface area of ultra-thin metal film centered around the invisible point of the comet nucleus, gathering the faint light of the stars [see fig 2]. Communication between bands within the community could easily be maintained by radio and laser.

Despite the limitations of the environment, Oort Cloud communities that choose to grow and develop large economies will have many options. One of the most obvious ways to enhance their resource base will be to create clusters of comet nuclei. Clustering would require the commitment of significant amounts of time, energy and resources, but the potential rewards will ensure that some communities will begin to move additional comets into more convenient orbits.

Given the average separations and relative orbital velocities of comet nuclei in the Cloud, it would take between five and ten years to bring a new comet into a cluster. The energy required represents only about 3% to 5% of the available deuterium supply; clustering will be relatively economical once the necessary resources are committed to the project. Clustering will probably be common, if only because large comets will be rare.

FIGURE 2: Schematic Representation of "Mirror Farm" arrays for harvesting starlight


Habitat for a single band of 25 people
"Tribal" array of 19-single band mirror farms. Population is about 500.
3000 km
30,000 km
200,000 km

Array of 1 MW mirrors to support band of 25.
Each circle represents an array of smaller mirrors.
The habitat would be located at the center of the array.

Illustration after Jones & Finney in Ref. 3

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Clustering would allow relatively large populations to exist, especially in the inner Oort Cloud, where the photon flux from the Sun will be fairly high and consequent energy production levels will be capable of supporting much larger communities. Jones and Finney have estimated that the largest practical population for a cluster will be about 100,000, when the energy consumed in transport between the dispersed habitats of the cluster begins to strain the reserves of the community. Social factors may also limit the size of large cluster-based communities.

In addition to clustering, there will be other means by which the settlements can enhance their economies. Their isolation in the depths of space will be a relative thing; they will be in constant communication with neighboring communities. The average separation between comets in the Cloud is thought to be a few light-hours; between settlements it will be perhaps a light-day. News, messages and other information will flow back and forth across the empty space between them.

Some settlements, particularly the larger ones, may engage in some sort of trade, both with the inner system and among themselves. Initially, many communities will need to import those items that they cannot make for themselves. As they develop, they may consider more complex forms of trade; it is certain the decision to expend the time, energy and resources in long-distance commerce will be a complex cost/benefit calculation.

Items for trade might include specialized technology, bioengineered species specifically tailored for conditions in the Oort Cloud, computer and AI programs, and information itself. Perhaps some communities will specialize within a larger dispersed cluster or bloc of trading communities.

Because of the constraints and limitation imposed by the environment, one primary social concern of the Oort Cloud communities will be the careful regulation of the health and size of their populations.

Until the settlement has developed the skills and resource base to support growth, some form of control will be necessary to limit the size of the population. In very small, isolated populations, even the timing of reproduction may need to be regulated, in order to maintain an appropriate distribution of age and sex.

Unless communities adopt fairly stringent measures, the population will inevitably grow. The members of the settlement will then have to choose between a higher rate of resource consumption, making a commitment to enhancing their resource base, or to assisting their excess population in establishing daughter settlements around other comet nuclei.

Both static and growing communities will also need to be concerned with the genetic health of their populations. Within the small, relatively isolated gene pools of the Oort Cloud settlements, population genetics will become a factor that will affect both everyday life and the long-term viability of the community.

Very early on, when a new community is being planned or established, a

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

major concern will be the "founder effect"—the skewing of the genetic composition of a population because its founding members are very few. The danger exists that the founding members of a community may share too high a proportion of deleterious genes that will soon become reinforced in subsequent interbreeding. This problem could be largely eliminated by careful screening during the planning and recruitment stages for a new settlement. New colonists would in part be chosen to maximize genetic variation in the new population, providing a sound base for healthy future growth.

Founding populations can be very low—perhaps as low as 10 or 20 individuals—if the original breeders are genetically diverse and share few common deleterious genes. The negative effects of early inbreeding can also be avoided by social customs or other regulations that prevent bad crosses, particularly among close relatives.

The potential negative effects of inbreeding will remain, however, as the settlement's population grows and becomes more uniform, but will be of major concern only to very small, isolated groups. Both natural and artificial selection will come into play before inbreeding could cause serious damage to the health of the community. In nature, inbreeding often results in a high level of spontaneous abortions and early deaths; natural selection operates to remove the bad crosses from the breeding population. In healthy communities, matings would be structured either by intent or by social custom to minimize the negative effects of inbreeding. It is also important to remember that genetic uniformity need not be a problem provided that any deleterious genes are eliminated from the founding population and that any new negative traits arising by mutation are culled or otherwise prevented from breeding. Genetic engineering techniques may also be employed to maintain a healthy gene pool.

The human consequences of such requirements for the maintenance of the community's genetic health will be great. The social tensions generated by the practice of eugenics and genetic engineering may also be difficult to manage. However, there are other options for communities that wish to avoid negative inbreeding, including outbreeding with other settlements.

Outbreeding has the obvious positive effect of increasing genetic variability. But its practice also serves as a mechanism for complex social interaction as well.

Prior to the terrestrial agricultural revolution, people tended to live within small hunting and gathering bands of about 20 to 30 men, women, and children. It has been noted by various social anthropologists that groups of this size still seem to be the most congenial to humans worldwide in both their private and professional lives. This preference is no doubt part of our physical and social evolutionary heritage.

But humans also tended to form larger social units, gathering into clans or tribes numbering about 500 or so. Normally dispersed as individual bands, the tribes maintained social cohesion through intermarriage. Indeed, the size of such

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

groups is just about the minimum number needed to maintain a healthy diversity within the common gene pool and to avoid inbreeding.

It is possible to anticipate, then, that the dispersed communities of the Oort Cloud may form similar social links. A single community tending an extensive mirror farm as described earlier could form a viable, self-contained breeding population by marriage exchanges between bands. In addition to preserving the genetic health of the community, such exchanges would serve to link the bands into a large, cohesive social unit. Just as dispersed tribes on Earth gathered periodically for important social and religious observances, so too might the dispersed bands of a comet-based settlement gather their entire population on occasion.

Outbreeding would also allow individuals whose reproduction might otherwise be restricted or forbidden to find an alternative, providing an outlet for any tensions that might arise. And if such a place could not be found within the tribe, there is also the possibility of exchanges with other communities around other nearby comets. Such exchanges would be more expensive in terms of time and energy, but would serve to cement social ties between settlements.

The necessity for monitoring gene flow within a given population, along with all the other shaping influences of the deep space environment, will have profound social consequences for the Oort Cloud communities.

Habitat residents will be able to set temperature, humidity, day length, the weather, atmospheric pressure, even the level of gravity according to their collective preference and the limitations of human physiology. They may even choose to live in zero gravity. Life style and social values, the entire "world view" of the Oort Cloud settlers will be very different from those of any terrestrial culture.

Without diurnal or seasonal variations, their sense of time will differ. Their perceptions and use of space may also differ, and the ways in which private and public volumes are used and arranged thereby altered. In a tightly closed artificial environment, attitudes toward clothing and nudity are likely to change radically, as is the concept of privacy.

In personal relationships, love, sex and mating will all be quite separate. Family structures are likely to be very different when marriage or cohabitation preferences may differ from permissible genetic crosses. Breeding will be much more of a social decision than it is on Earth. Given a basic band-and-tribe social structure, extended families are likely to be common. Communal or collective family arrangements may also be common.

Social, political and administrative systems will also change, and new ones will arise. They will be shaped not only by the age-old needs and limitations of human social interaction, but also by wholly new factors unique to the deep space environment. Settlers in the Oort Cloud will face the exciting challenge of creating workable societies from whole cloth.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

As always, the basic social conflict within these communities will be between the needs and constraints of society as a whole and the personal freedom of individuals. Members of these small, isolated communities will be faced with a variety of constraints.

Restrictions on breeding practices may be imposed by the community in order to maintain a balanced, genetically healthy population. In very small settlements, even the timing of births may be regulated in order to preserve a balanced distribution of male and female, young, middle-aged and elderly. Communities aiming for a low or static population growth rate may impose strict absolute limits on breeding until the resource base has been developed to support larger numbers.

Similarly, young people born and raised in an Oort Cloud settlement may face fairly tight constraints in their choice of career or vocation. As in all economies, the needs or demands of the community will determine the types of work available; career choices may often be a matter of timing and happenstance. In small communities, where age and gender distributions may have to be carefully controlled, career choices will be limited for the limited number of youths available for apprenticeship: they will be pressured to take the positions that need to be filled as they come of age.

New settlements with undeveloped capabilities, and smaller settlements with few resources or a limited energy supply may also impose some restraints; small, isolated communities will probably be conservative in approving unnecessary expenditures of scarce resources, thus limiting the range of possible private and professional activity.

Social values are likely to have an enormous shaping influence on the types of social systems that develop in the distant Oort Cloud communities. These settlements, perhaps comprised of highly interrelated clans, are likely to place a high value on cooperation, consensus decision making, and compromise. In the hostile and unrelenting deep space environment, where cooperation and mutual interdependence will be crucial to survival, they will feel a strong need to maintain social harmony.

Members of such tightly knit communities will face a variety of social pressures: they will be part of a symbiotic network of duties and obligations. There will be ties to family and to tribe or clan, in addition to the community as a whole. Complex interrelationships will arise when emotional and sexual relations must be separated from breeding, as well as when family and friends emigrate to other habitats and communities. As in Earthbound societies, education, in addition to training each person for the complex task of deep space survival, will probably also serve as a primary means of inculcating the community's social values.

But there are other factors to counterbalance these pressures and constraints, to allow for the preservation of individual freedoms. In a community where every individual represents a heavy investment in education and training, and a valuable pool of badly needed skills and experience, rigid social con-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

trols such as ostracism, imprisonment, or capital punishment seem unlikely; a large range of social behavior will have to be tolerated. Coercion would be difficult at best, especially in very small communities with few resources or personnel to spare for "police actions"; nonconformists and dissidents must be allowed to find or to create an acceptable niche within the community. Larger settlements, in which any one individual plays a less vital role, may develop more rigid social structures.

The Oort Cloud communities will need to develop social and political mechanisms to ensure the freedom to express diversity and individual choice, to avoid oppressive measures aimed at enforcing unnecessary conformity to arbitrary community standards, and to eliminate or at least alleviate the negative consequences of community decisions.

It is likely a wide variety of social systems will develop among the Oort Cloud settlements. In some, social pressures may win out, and a rigid, authoritarian social structure created. But the need for consensus and close cooperation among community residents may help prevent the development of oppressive, highly stratified societies, at least among the smaller settlements. Similarly, the necessities of cooperation and mutual dependence will temper any tendency toward extreme individualism. Individuals will be expected to take responsibility for their actions and their role in the community; both wild individualism and blind obedience to social convention would be frowned upon.

In such a social context, within a culture that values diversity, mutualism, and social harmony, current Western-style democracy may be considered inappropriate. Despite constitutional guarantees, majority rule often enforces homogeneity and suppresses minority viewpoints. Democratic systems, in which individuals are expected to "vote in their own interests," might also foster a divisiveness that small, isolated communities could ill afford.

The smaller band-and-tribe settlements may favor consensus decision making, in which minority and dissident viewpoints can be more easily accommodated. But such systems also have a drawback: because everyone must agree to the joint decision to reach a consensus, community members may feel pressured to "go along with the group." If the pressures became strong enough, they might foster a dangerous and oppressive homogeneity.

Another communal decision-making system that often appears among communities of closely-related, tribal peoples is the "hardship-on-no-one" arrangement. In such a system, the emphasis is not so much on the final decision reached as on the consequences of each option. Decisions are often based on finding the option that places the least burden on the least number of individuals, and working to alleviate even those negative results of communal decisions. For example, youths guided toward a career specialty the community deems important might be allowed to pursue secondary specialties of their own choosing.

A drawback to this system as well as for consensus decision-making systems

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

is that they are often very time-consuming processes.

As on Earth, the Oort Cloud communities may choose to deal with some social pressures by displacing them spatially. Nonconformists and dissidents in one band may find a comfortable and rewarding social niche in another habitat within their native tribe. Although a single clustered community would have a pool of shared communal values, each habitat within the settlement might have its own individual system, offering enough diversity to accommodate and alleviate most social frictions. As a last resort, migration between settlements would provide a social safety valve.

It thus seems likely that a variety of social systems would arise among the Cloud settlements. They will have to respond to numerous needs and demands, seeking to find a balance between maintaining a stable, functional society and personal freedom for individuals.

The size of the community will be an important factor in its social development. The larger Oort Cloud settlements will probably offer a wider range of social forms. They may be able to accommodate more competition and divisiveness. Large communities, however, are also difficult to administer by consensus, and may employ a form of electronic democracy. Clustering, trade, and the development of the settlement's resource base and capabilities would create opportunities for the creation of more diverse and complex societies. A mosaic of many different social forms, distributed throughout the settlement, seems possible.

But even the largest of the Oort Cloud communities will be quite small in comparison to the societies of billions that will develop in the inner Solar System. As the relatively compact inner core of the system is developed, it will become more tightly integrated socially and economically, more centralized, and its culture more homogeneous. Although it may take some centuries, it is likely that mass cultures with populations of billions will eventually develop.

The small, dispersed communities of the Oort Cloud will remain largely independent of the inner core governments and societies. Their potential for diversity may offer a refuge for dissident groups seeking to leave the mass societies of the inner Solar System.

Just as the relative isolation of the Oort Cloud settlements from the inner system and from each other will foster social divergence and cultural diversity, so, too, will it create the conditions necessary for biological divergence and evolutionary change. As we know from terrestrial experience, reproductive isolation fosters such change—as Charles Darwin observed when he visited the Galapagos Islands as a young man. Diversity also fosters adaptive radiation—the opening and exploitation of new niches in the environment.

Many factors are likely to encourage human evolutionary diversity in the Oort Cloud. Despite all efforts, the founder effect and random drift will cause some changes in the small isolated gene pools. Fortuitous beneficial mutations may be retained and encouraged to spread, and perhaps enhanced by ar-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tificial means. Eugenics and genetic engineering are likely to be well integrated into the social and economic life of the settlements, both as a means of maintaining a healthy gene pool and in the production of goods and trade items. Bioengineered products may be common.

Social values will also be very different, and the distant Oort Cloud communities will feel much less keenly the social, cultural and governmental pressures that might prevent biological experimentation among the inner system cultures. Their environment and lives will be very different; they may choose to remake themselves in their own image, to adapt themselves to the needs of living in deep space.

Estimates of the time required for natural selection to produce a new species of human being range upward toward a million years. However, in the small, isolated gene pools of the Oort Cloud settlements, perhaps encouraged by directed breeding practices and human genetic engineering, it would not take long for any chances to become widespread. Minor changes might take a few generations—perhaps a century—to become entrenched. Major structural or biochemical alterations would probably be attempted more slowly, on a scale of many hundreds or thousands of years. But it is clear that a new species of genus *Homo* could appear within about 10,000 years.

The exploration and settlement of the far reaches of the Oort Cloud will also have a profound effect on the course of human migration to other star systems. Simply reaching the Oort Cloud and establishing viable, long-term settlements there will spur the development of the technology required for interstellar flight. Although the propulsion systems needed for journeys of tens of hundreds of light-years will differ from those used to travel only one or two, the opening of the Oort Cloud will serve as the proving ground for such systems, as well as the development of closed artificial ecosystems. The social experiments of the Cloud communities may also play an important role in starship design.

Though many interstellar missions may be launched by the large and wealthy inner Solar System cultures, others may depart from construction sites or launch points in the far reaches of Sol's Oort Cloud, which stretches out to perhaps two light-years—a significant head start. Such ships may travel directly across the deep oceans of space to reach other stars, but others may visit way stations during their journey: comets drifting in interstellar space [ref 9].

Estimates of the total amount of material ejected from the Solar System during its formation and subsequent evolution range from as low as 5 to 25 times the mass of the Earth up to 100 or even 1,000 Earth masses. Presumably, other stars would produce roughly similar numbers of rogue comets. Interstellar space should be strewn with small, isolated islands.

Distances between these drifting islands are difficult to estimate. They may be no more widely spaced that the comets of the Oort Cloud—about 20 A.U. Other estimates range up to hundreds

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of thousands of A.U. between these wandering interstellar comets.

Some of these interlopers are bound to be found within Sol's own Oort Cloud, working their way free of the Sun's grip, at perhaps one in every several thousand. Relative velocities between Solar and interstellar comets will be low, and it will be tempting for Oort Cloud residents to hitch a ride outward—perhaps farther out into the permanent Cloud, perhaps out into interstellar space. Drifting outward at about 10 km/s or about 2 A.U. per year, they will make slow progress indeed. In 50,000 years they will be halfway to the nearest stars. But by then they will be wholly adapted to life in interstellar space and will perhaps not be too concerned with visiting other star systems.

One could imagine the human species slowly spreading throughout the galaxy in this way, but it seems more likely humanity will move from star to star by fast ship, followed by slowly expanding waves of comet-based settlements meeting and overlapping in the voids between the settled stars.

Other, more daring Oort Cloud communities may choose to take their home comet with them. If the slow outward drift seems too slow to them, and fast ships too expensive, they may attempt to launch themselves out of the Solar System via a gravity-assist maneuver close to the Sun [ref 7].

Large rocket engines burning hydrogen and oxygen, or perhaps a mass driver, could be used to dissipate the comet's orbital velocity using only a fraction of the comet's resources. During the long fall toward the Sun, the adventurers could use the rapidly increasing flux of solar energy to produce huge stores of hydrogen, to be consumed in fuel cells to provide power during the long interstellar cruise. The mirror farms or other solar power collectors would also serve to shield the comet nucleus from the Sun.

After curving around Sol, the comet would leave the system with a velocity of 100 to 150 km/s, or about 1 light-year every 2,000 years. Travel times between star systems would be on the order of 10,000 years—far shorter than that of drifting "wild" comets. During the interstellar journey the settlers would live as they had in the Oort Cloud, relying on their comet's stock of deuterium or on hydrogen produced when close to the sun. In the target system, a small band of colonists would be dropped off aboard habitats constructed during the long cruise, before rounding the new star and heading off toward a new destination.

It thus seems likely that human expansion into the comet archipelago of the distant reaches of the Oort Cloud will only be the first step toward expansion to other star systems. Comet-based settlements will be humanity's stepping stones to the stars, across the far-flung islands in the deep ocean of interstellar space. ■

BIBLIOGRAPHY

1. Freeman Dyson. "The World, the Flesh and the Devil," Third J.D. Bernal Lecture, May 1972; reprinted in Sagan (ed.): *Communi-*

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

cation with Extraterrestrial Intelligence. Cambridge, MA: MIT Press (1973).

2. Ben R. Finney and Eric M. Jones, editors. *Interstellar Migration and the Human Experience*. Berkeley, CA: University of California Press (1985).
3. Eric M. Jones and Ben R. Finney. "Interstellar Nomads" in *Space Manufacturing 1983; Advances in the Astronautical Sciences #53* (1983), pp 357-374.
4. Robert H. MacArthur and Edward O. Wilson. *The Theory of Island Biogeography*. Princeton, NJ: Princeton University Press (1967).
5. Magoroh Maruyama. "Diversity, Survival Value, and Enrichment: Design Principals for Extraterrestrial Communities" in *Space Manufacturing: Proceedings of the 1975 Princeton/AIAA Conference*. AIAA (1977), pp 159-266.
6. Magoroh Maruyama. "Social and Political Interactions among Extraterrestrial Communities: Contrasting Models" in *Technological Forecasting and Social Change*, v 9 (1976), pp 349-360.
7. Gregory L. Matloff and Kelly Parks. "Interstellar Gravity Assist Propulsion: A Correction and New Application" in *Journal of the British Interplanetary Society*, v 41 (1988), pp 519-526.
8. Carl Sagan and Ann Druyan. *Comet*. New York: Random House (1985).
9. David G. Stephenson. "Comets and Interstellar Travel" in *Journal of the British Interplanetary Society*, v 36 (1983), pp 210-214.
10. Fred Whipple. *The Mystery of Comets*. Washington, D.C.: Smithsonian Institutions Press (1985).
11. Laurel L. Wilkening, editor. *Comets*. Tuscon, AZ: University of Arizona Press (1982).

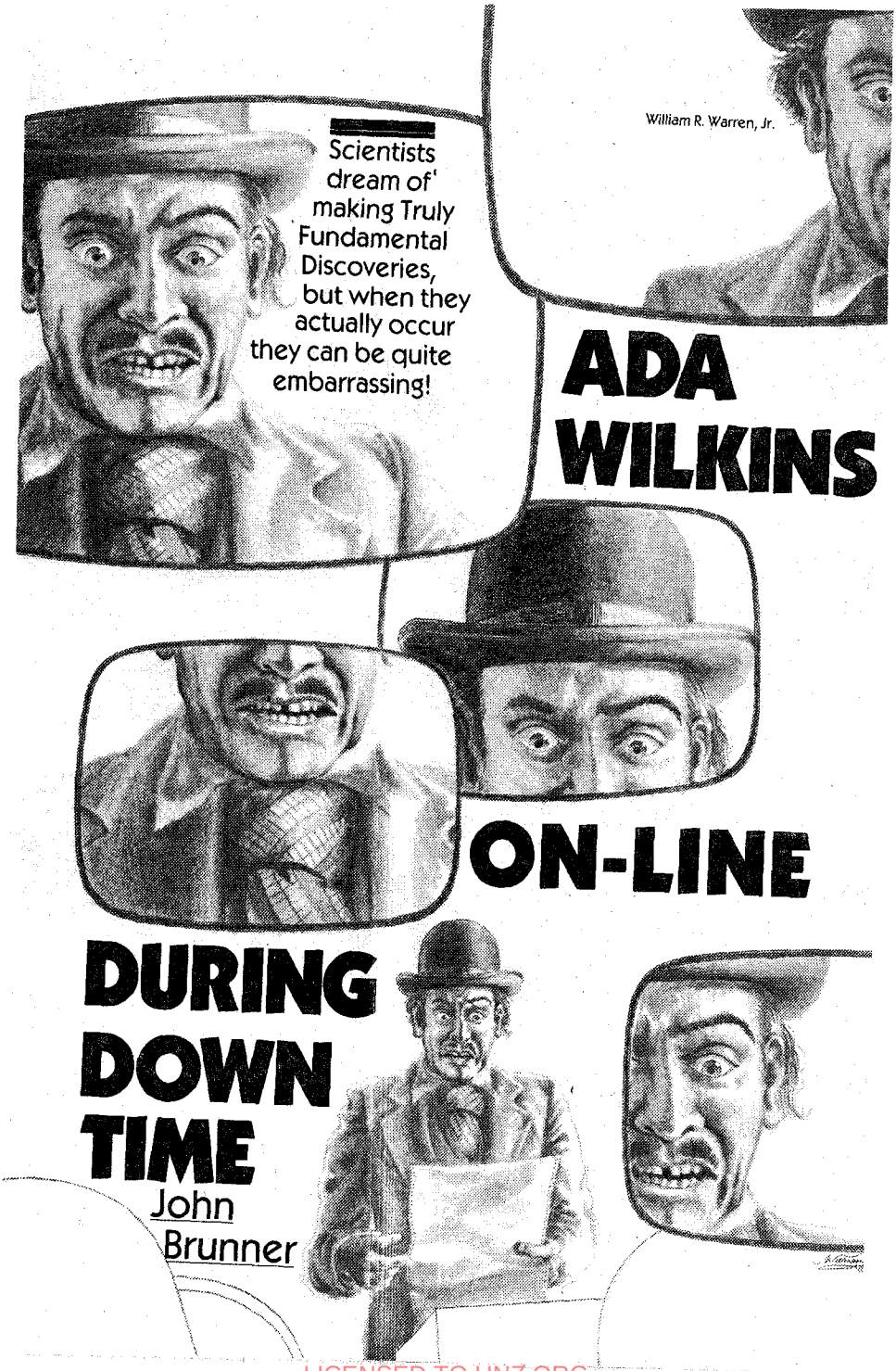
●Not to admit poverty is a disgrace—but not to get away from it by work is a greater disgrace.

Thucydides

●It is more difficult to rise to the occasion than to stand above the conflict.

Antonio Machado

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED


Scientists dream of making Truly Fundamental Discoveries, but when they actually occur they can be quite embarrassing!
William R. Warren, Jr.
ADA WILKINS
ON-LINE
DURING DOWN TIME
John Brunner

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Oh, well," sighed the minister for energy and industry. "Better make a move, I suppose. . . . Where's my speech?"

His parliamentary private secretary, a dapper young man named Hornby, produced a sheaf of paper with a flourish, and he read a few sentences to make sure it was the right text. It had been over a year since the bridge-opening at Dunbar, but recollection of how he had arrived for it carrying the address he had already delivered a week earlier at a fund-raising bazaar in Woolton Parva still rankled.

Fortunately this one was correct. It was full of resounding phrases about how all those jealous foreigners who wanted to regard Britain as a spent force were having their noses put out of joint because of the worldwide interest being shown in the latest and conceivably greatest British innovation—ultraconductive cable that could transmit vast quantities of data over virtually any distance without the need for repeaters.

All dreadfully technical stuff, of course. Oh for some easy assignments again, ship launchings and party banquets and that sort of thing. . . . Still, needs must, for the devil was certainly driving the country at the moment. When it wasn't strikes it was scandals; when it wasn't bank-raids it was bankruptcies.

Which having come to mind, he said, "Hornby!" And heard how unable he was to disguise the hint of nervousness in his voice.

"Yes, sir?"

"Graveney's did sort out that trouble they had with their work force, didn't they?"

"You mean the industrial dispute which caused them to postpone the original launch date?"

"And caused us appalling inconvenience, even down to having to amend the invitations we had extended to so many people to witness yet another milestone on Britain's long and admirable road of achievement! As a result, I gather the delegates from the EC have decided not to attend! You did make sure we're not likely to be let down again?"

"I rang Mr. Graveney first thing this morning," Hornby said. "Although he was not in the best of moods, having he said worked all night on the circuits, he assured me everything tested out perfectly at six A.M. There's only one rather regrettable setback: it's possible the inventor herself may not attend the ceremony. Worn out, apparently—exhausted by lack of sleep."

"Well, that's what comes of putting a woman in a position of authority," the minister muttered, tucking his speech into his portfolio and checking his appearance in the office's wall mirror. "No—no *fiber*. No toughness!"

And then, with shock spreading across his features: "Did you say the inventor?"

"Yes, sir," Hornby returned in puzzlement. "Dr. Julie Underwood, that is."

"My God," the Minister exclaimed with magnificent disgust. "Sneaking in everywhere these days, aren't they? As the saying goes, 'turn any wet stone!'

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Got any more nasty little surprises up your sleeve?''

''I beg your pardon?'' Horny blinked. ''I don't quite follow. After all, the PM—''

''She's the exception that proves the rule!'' the minister barked. ''I presume the wog delegations will all be men, but what about this African minister who's coming? Is that a woman too? Have the Japs sent a woman to represent Kikoshita Industries? I do need to be properly briefed!''

''Not as far as I know,'' Hornby sighed.

''I hope you're right,'' the minister said, and gathering his portfolio swept out to board the limousine that would deliver him to his helicopter.

''The formal switching-on will take place at noon,'' Hugh Graveney explained for the twentieth time to his pursuing gaggle of reporters. They could and should have read what he was telling them in background documents distributed in advance, but seemingly none had bothered.

Which was all too typical of current practice anywhere in Britain. . . .

''Following that, drinks will be served, and a buffet lunch at one. At two-thirty, the minister is scheduled to depart for his next engagement, and between then and three o'clock the other VIPs will go their various ways. But none of this, remember, is more than a symbol—a symbol to mark the moment at which one of the outstanding inventions of modern times is published to a world sorely in need of it!''

Silently offering thanks to whoever in the PR department had coined that phrase, he turned the last corner of the succession of corridors down which he had led the reporters so that they could glimpse a few of the laboratories where the actual research was being carried out. As the group welled out across the main foyer, where bunting was being draped over the temporary dais on which the actual ceremony would take place, he reached his peroration with what was financially the most crucial point of all.

''As well as securing valuable export orders—you've been told about people coming from Africa and Asia and the Middle East—this breakthrough should assure an excellent price for our company's shares when we go public on Monday next. Merchant bankers Kray & Haig are masterminding the issue, and further details can be had from them or from Miss Pink and Mr. Frownlee of our own staff who are standing by to help you. In a moment I must go and greet our foreign guests, but I can spare time for a couple of questions. Yes?''—to a reporter wearing a particularly trendy outfit.

''Where's Julie Underwood?''

It was plainly a question they would all have liked to put. Those with cameras raised them, glancing around.

''She was working until six this morning on final tests,'' Hugh grounded out. But this was an inevitable hurdle to be faced sooner or later. . . . ''She deserves her rest.''

''Was that photo really of her, or was it a stand-in?''

Hugh clenched his fists. It had seemed like a good idea at the time to include that holiday snap of Julie in a bikini along with the others of more conventionally garbed staff members in the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

firm's annual publicity calendar, but—but—but—!

He fought to keep his voice calm as he answered.

"Dr. Underwood is walking proof that being beautiful and being brilliant are not incompatible. I assure you she had no need of a stand-in. Speaking of which, who are you standing in for today? Where's the competent, intelligent person I was expecting your editor to send along?"

A multiple chuckle indicated that some of the reporters were amused at this discomfiture of an unpopular colleague; thank goodness, because it had been a risky gibe.

"Any questions that really amount to something? I have to run in—hm!—less than two minutes."

A serious-faced young man raised his hand. "Mr. Graveney, why was it necessary to continue tests overnight before the official inauguration?"

"We had an industrial dispute," Hugh snapped back. And, in defiance of what the PR department had advised, because he was very tired, he amplified the answer into an explanation.

"Some of the workmen refused to take orders from Dr. Underwood unless they were paid a bonus for having a woman in charge. This is, of course, illegal. When we tried to sack them, though, they appealed to their union for authority to strike. The union, which is fully in accord with the sex-discrimination laws, refused. But by the time we were given permission to discharge the bigots we were a month behind schedule."

"So," from the same questioner, "even though ultraconductive cable has been evaluated under lab conditions, until today it had never been fully tested in a normal operating situation?"

That earned a glare, but it was a fair question.

"If you mean we have never previously tested a cable stretching from here to Birmingham, laid underground in the usual fashion, sharing conduits with power-lines and phone-wires and water pipes and sewers . . . that is the case. But we had excellent results last night, well up to our computerised predictions. Now you must excuse me. My aides are making frantic signals."

At the railway station a group of staff members from Graveney & Graveney Limited stood waiting, well ahead of the scheduled time, at the spot on the platform where the first-class carriage of the express from London was due to halt. It was raining, and there were not enough umbrellas; moreover—on top of a delay caused by the breakdown of the preceding train, which was still reverberating through the system—a computer error had resulted in the first-class carriage being hung on the back of the train instead of adjacent to the buffet car. Good old British Rail!

These events had done nothing to sweeten the temper of Mr. Oshihara, procurement director at large, to render his title in equivalent terms, of Kikoshita Industries, Osaka. In accordance with the tradition he had been raised in, he was forbearing to comment. But he was tight-lipped and distinctly pale, and when met by the firm's representatives he confined his response to the formal minimum of courtesy.

Sweating, aware of what a bad

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

impression had already been made on their potentially most important client, used as he was to the flawless time-keeping of the *Shinkansen,* they ushered him and his companions to a waiting limousine and hurried him away. Meanwhile a group headed by a girl speaking Arabic dealt with the occupants of the other compartments, delegates from oil-rich countries handicapped in their attempt to join the modern world by lack of precisely such cheap and reliable internal communications as the Underwood cable promised, and likewise loaded them into large luxurious cars.

At the opposite end of the platform, where he had descended from a second-class compartment which for once was not unbearably overcrowded, Philip Nyanza noticed that left two more people with the air of having been told to meet a visitor, between whom an argument was breaking out. It seemed logical to approach them. He did so, turning up his coat collar against the pelting rain.

He was only a few feet away when they suddenly registered his presence, and in a flurry of apologies inquired whether he was who he was. He did not deny it.

And then it turned out why they were upset—quite apart from what, plainly, they regarded as his bad taste in travelling second class. Someone had fouled up and there wasn't another car for him.

Philip sighed, making unavoidable mental comparisons between Europeans' aspirations and their ability to put them into effect. Mildly, however, he said, "Well, I'm sure there must be taxis."

And by phoning for one they managed to arrive at the firm's HQ just in time for a hasty handshake with Hugh Graveney before he had to rush out into the rain and welcome the minister from his helicopter.

Even by that early stage, things were going badly awry. As near as Philip could figure it out, the fact that Mr. Oshihara invariably travelled not just with an interpreter but also with a chaplain, or whatever the equivalent was in the Shinto religion, had not been brought to the attention of those responsible for arranging the seating. Since it would have been an egregious insult for the said chaplain not to be accorded a place befitting his employer's dignity, there was one seat short.

The two who had escorted Philip here vanished in a flurry of renewed apologies, to try and find an extra chair from a distant office, all the nearer ones having already been raided.

Oh, well, it was common knowledge that Kikoshita was rich enough to buy and sell entire nations. . . . Sighing, Philip withdrew to a corner, near a door standing slightly ajar.

From beyond it someone said, "Philip Nyanza!"

A beam lit his face as he turned.

"Julie darling, I'd know your voice anywhere! Say, why aren't you out there with the bigwigs?"—in a low tone, for she was standing back from the doorway as though afraid of being noticed. She wore a dark suit, but her hair was fair and bright as ever.

"Oh. . . !" A gesture of annoyance mingled with disgust. "I used the excuse of having been up all night to get out of this. Hugh and his publicity

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

stunts—! I've had previous experience of them. Did you hear?"

"The episode of the calendar?" Philip suggested.

"Right in one," Julie said bitterly. "It's a marvellous picture, the best I've ever had taken, and while I can't claim credit for my looks I don't see why I shouldn't be proud of them. But ever since then I've been—been sold at a discount! *Playboy* is pestering me for a session in the nude! So with all these reporters swarming around I decided it was safer to keep my head down. Particularly since I've been trying to insist on a postponement. You heard about the bastards who wouldn't take orders from a woman and put us a month behind schedule—yes? How very British, hm? But the minister said he can't make it next month, going to be abroad, and Hugh reacted as though having a real live cabinet minister here would confer some sort of divine grace on the deal! Lord, you'd think that being in government elevated you to a higher plane of existence. . . . Philip, I'm sorry!" She caught at his hand. "I keep thinking of you as you used to be in our post-graduate days. But you're in government yourself now, aren't you?"

"For my sins," Philip admitted, "they did inveigle me into accepting the ministry of telecommunications and data-processing, but in a country where it's hard to raise an appropriation for anything more expensive than a talking drum that's pretty much of a sinecure. I spend one or two days a week on it. The rest of the time I devote to my own research at the—*the*—university. I've been getting more and more interested in what I regard as under-exploited primitive inventions in the field. If you see the *Proceedings* of the African Society for the Study of Communication you may have noticed a few of my papers. . . . No?"

Keeping his voice low and drawing closer so as to speak confidentially, he was now partway through the door. She urged him a pace or two along the passageway beyond, where they would be safely out of sight.

"Sorry about that," she muttered. "But on top of everything else I definitely don't want to meet this cabinet minister Hugh is so keen on. He loathes women—lord knows why, though one assumes his mother must have had a lot to do with it. I never yet heard him deliver a speech without a sexist gibe in it. I bet he's the type who pays prostitutes to dress up as nanny and smack his bum! Heaven knows how he's kept his job. . . . Where were we?"

"You," Philip said with a wry smile, "were about to admit that you haven't read my recent publications."

"Philip, as a matter of fact I—"

"Not to worry. Nothing I've been working on is of Nobel prize stature. This breakthrough of yours, though. . . . It does really work, doesn't it? Your tests did go off OK?"

Julie conjured up a tired smile. "Oh, splendidly. Apart, that is, from the call we had from Ada Wilkins."

"Is that some sort of in-group joke?" Philip hazarded.

"I sincerely hope that's what she's going to become. If not . . ." She bit her lip. "Oh, hell! Of all the anomalous phenomena I ever ran across, this is the worst. I quit at six this morning saying I was going to catch some sleep, and I

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

genuinely meant to. But I couldn't stop trying to figure out how Ada Wilkins got on-line to us. I still can't''—with a sour chuckle. ''And the mystery is driving me up the wall!''

''What happened?''

''We'd been running routine checks to eliminate various minor kinds of interference. There were some transient eddy-currents at places where our cable shares a route with a main power line, and we had one interface mismatch that gave us hell's own headache because we really are handling two-to-the-fifteenth-power separate channels, just like the handout says, *and* with negligible loss of signal-strength over planetary distances! But I don't have to ply you with sales-talk, do I?

''It was immediately after we sorted out the interface mismatch that we got this—this *phenomenon* I can't account for. We had the test rig set up, the one that passes all the television channels and banking and governmental *and* commercial telephone, fax, and computer-to-computer systems via this single cable which is so cheap we can afford, I mean even poor bankrupt Britain can afford, to install three or four backup cables to avoid the risk of . . . Oh, God. Here I go again. it's what comes of having no sleep to speak of for a solid week.''

''This promised low cost is among the features that lured me here,'' Philip said gently. ''If we must be dragged kicking and screaming into the twenty-first century we'd rather not be overcharged for that doubtful privilege.''

Breaking into a broad grin, she gave his hand another squeeze.

''Philip, you're refreshing! You're a nice down-to-earth person, and after all the bullshit I have to take from Hugh and—''

''And from your experimental set-ups?''

''You so-and-so!'' But the grin remained. ''Well! It turned out this mismatch had occurred at a disused graveyard in Leamington Spa, where someone forgot to allow for subsidence due to the collapse of graves that still held partly intact coffins. Gruesome, isn't it?''

''You should be like me descended from a long line of witchdoctors,'' Philip said with a chuckle. ''I grew up playing with half a dozen of my ancestors' skulls. Come to the point!''

''Yes, sorry.'' She passed her hand wearily through her hair; it had been tolerably tidy, and was immediately tousled. ''Well! We were supposed to be transmitting a stock test-sequence simulating anything the cable may be required to carry, and when the mismatch had been sorted out we expected to find a flawless correspondence between the signal on our route and the one transmitted by regular BT lines. We got, I suppose, one of the proverbial 'million monkeys.' With absolutely no warning, a message in plain text turned up on the monitor. It ran, and I quote verbatim: 'This is Ada Emily Wilkins née Crosthwaite and I want to talk to my son Reggie.' ''

''But—!'' Philip took half a pace backward, seeming stunned. Julie fixed him with luminous blue eyes.

''I know exactly what you're going to say. Someone is playing an elaborate practical joke. Because the minister is Reginald Crosthwaite Wilkins, isn't he?

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

But you have no idea just *how* elaborate, any more than I did when I got on the phone about nine o'clock after failing to get to sleep.

"His mother was called Ada Emily. She died thirty years ago. She was buried in the cemetery our cable runs across, which was still in use at the time. What," she concluded with a snap, "would your witch-doctor ancestors make of *that?*"

Before Philip could reply, they were interrupted. An anxious face appeared at the door behind him.

"Minister Nyanza, I do apologise! It took longer than I expected to find another chair, and then I couldn't find you! Everybody's waiting for— Why, Dr. Underwood!"

"Ignore me!" Julie rapped, and gave a theatrical glance at her watch. "It's past midday, and if you have to find me a chair as well that'll mean even more delay. Philip, come back as soon as you can, hm?"

He blew her a kiss and let himself be led away.

The scowls and glowers due to his late reappearance having subsided, the ceremony proceeded as planned. In fulsome terms provided by his company's PR department plus an outside consultancy, the minister was lauded by Hugh for things he was not entitled to claim credit for, such as research funds allotted by his predecessor.

It's always good to keep in with the chiefs, Philip glossed. Silently, of course.

Then the minister launched into his own speech, which lasted twice as long and was even more irrelevant. By way of a change, instead of being sexist it was jingoistic. Its bombast grew first tedious and then—at any rate in the view of the Arab visitors and Mr. Oshihara—offensive. To be bragging of the days when Britain ruled "the empire on which the sun never set" was, to put it mildly, tasteless in view of the present world situation. Even Hugh, who had regarded it as a great *coup* to secure him for today's show, began to look alarmed.

Luckily Hornby, the PPS, managed to slip a note under the minister's eye, and in a highly parasyntactical fashion he rushed his oration to a climax.

"Now it is my pleasure and privilege," he appended, while leafing rapidly to his speech's final page, "to close a switch and inaugurate the first of what, God willing, shall be thousands of British-made underconductive cables the world around. Ah—is this the right button?"

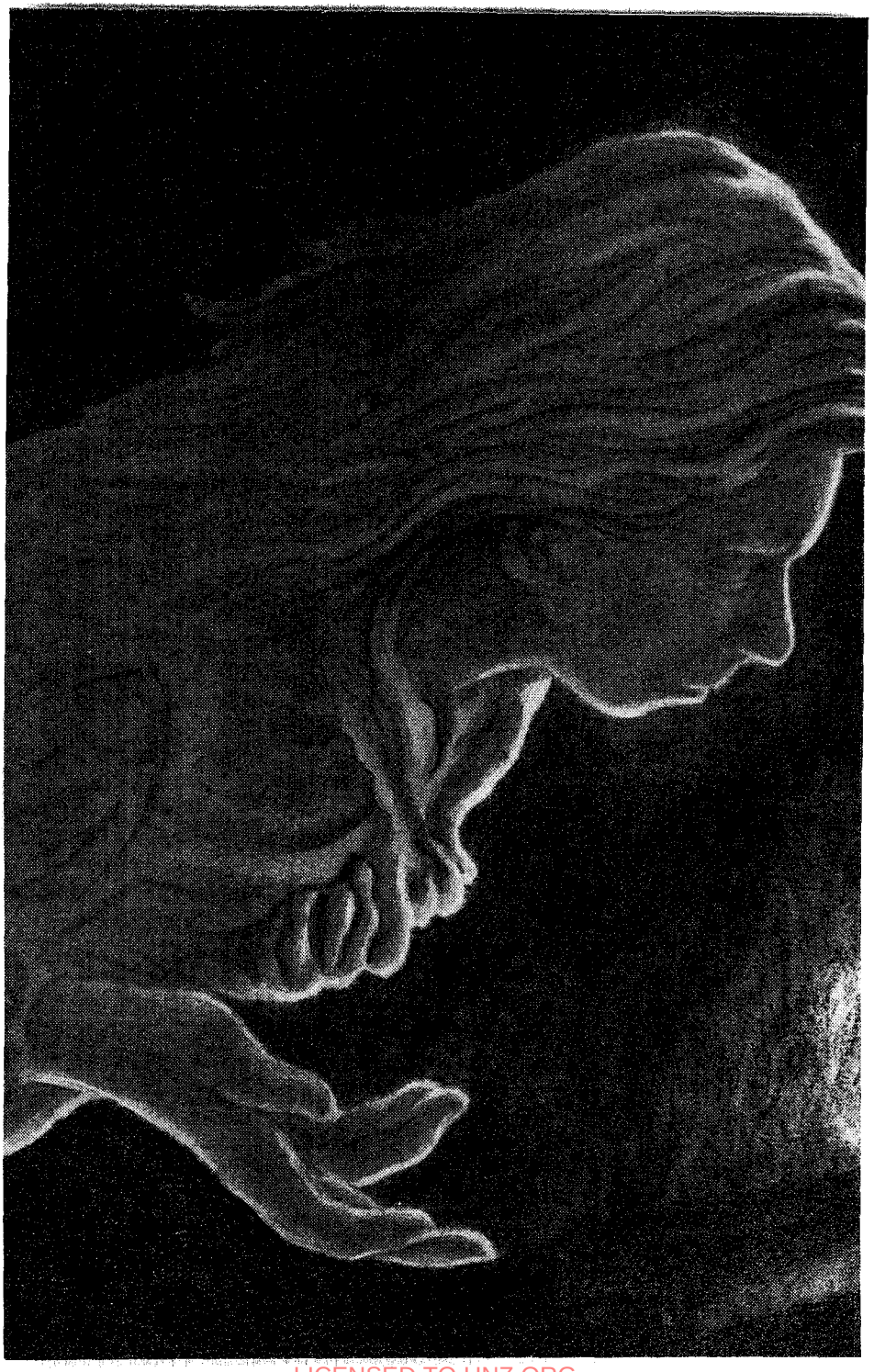
He was reassured, and with bulldog determination pushed it.

Instantly the archaic printer specially installed on the dais so that he would have a hard-copy souvenir to take home, began to buzz. Its paper scrolled up line by line. Bending to it in the confident expectation of something to set alongside those classics from the early days of modern communication, "Come here, Mr. Watson!" and "What hath God wrought?" Reginald Crosthwaite Wilkins, minister for energy and industry, read—and looked again—and uttered a single heartfelt cry.

"Mother!"

Beside himself with rage and disappointment, Hugh surveyed the scene of what he had hoped to be his great moment. The hall was almost empty. The

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

minister, fuming about insults offered not only to himself but to a memory he had held sacred for thirty years, had returned to his helicopter almost at a run. Thereupon all the other VIPs had likewise evaporated. And the reporters had scattered to file stories which, Hugh knew with sick certitude, would make the company a laughingstock.

As to stock: already the merchant bankers, Kray & Haig, had rung up to issue a solemn warning that they might not, after all be in a position to handle the issue of shares in Graveney & Graveney next week. . . .

Between the Scylla of mockery and the Charybdis of bankruptcy, there might nonetheless still remain a course to be steered. Pulling himself together, Hugh bestowed a final scowl on the printer that had produced that unbelievable, that ridiculous, that horrifying message, and headed for his office, shouting for those of his junior staff who were not on duty at the Birmingham end of the circuit.

"And find Julie!" he barked at his secretary Di Pink as he stormed past her. "She's got to be told, too!"

"She's having lunch," was the unexpected answer.

"What?" Hugh stopped dead in his tracks.

"Yes, with the African gentleman, Mr. Nyanza. She said it was a shame to throw away all that food because it isn't on sale or return."

"I don't believe it! How she could possibly have an appetite after what's happened . . . ! OK, tell everybody that we're in the dining room. Let's at least hope Mr. Nyanza is sympathetic even if no one else is!"

* * *

"Naturally," Julie said around a mouthful of salmon mousse vol-au-vent, "all but a couple of my technical staff are strung out along the line watching for any recurrence of the sort of interface mismatch I told you about earlier, or else they're in Birmingham. We never dreamt anything would crop up here that Hugh or I couldn't fix. After all, we've been eating, sleeping, and breathing ultraconduction for about five years. Did you notice how that fool of a cabinet minister—? Oh, hello, Hugh! Decided to do the sensible thing and save this splendid nosh from going to waste?"

She reached for a cracker spread with caviar.

"How can you think of food at a time like this?" Hugh snapped, sitting down beside her. "Minister Nyanza, I'm sorry to be so rude. I ought really to be saying how much I appreciate your still being with us, when—"

"When all the other rats have deserted the ship?" Philip offered, a mischievous glint in his eyes as he selected a wedge of cold quiche. "Oh, I'd have stayed on for anything short of the roof falling in. Julie and I did postgraduate work together. I'm glad of the chance to meet her again."

Hugh brightened a fraction. Then he visibly remembered where Philip hailed from: a tiny impoverished corner of Africa which Kikoshita Industries could have bought a dozen times over. It was no use looking for salvation from that quarter.

"What the hell can have happened?" he moaned, and buried his face in his hands.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"That's exactly what we're talking about," Julie told him briskly. "Neither of us got a clear sight of today's message, and I gather from Philip that the minister was so furious he ripped it out of the machine and stuffed it in his pocket. Did you catch even a glimpse?"

"Yes, I saw it clearly," Hugh muttered, knuckling his eyes. "I didn't have time to memorise it, but as near as I recall it went this way: 'Reggie, I suppose you think you're very smart being a minister and all, but wait until I get my chance to tell on you about—' And that's where it had got to when Wilkins screamed, 'Mother!' "

"Why not pull back the full text?" Philip suggested practically. "I assume you must have it in memory."

"That's the hell of it!" Hugh sat upright and banged his clenched fists on the table. "This display was such a rush job, we didn't bother to connect an automatic dump to the demo line. What would have been the point, anyway? The link was only scheduled to transmit some empty but quotable phrase that our PR team had come up with!"

"Oh, Hugh!" Julie said reproachfully, with a twinkle in her eyes. She took another of the caviar-laden crackers and crunched it noisily.

Before a row could develop, Philip inserted, "On what basis, then, can he have identified the sender of the message? You seem sure it didn't include the name Julie tells me cropped up at six this morning."

"Absolutely," Hugh grunted. As though his appetite was returning, he picked up one of the crackers Julie so much approved of, and continued with a full mouth. "Perhaps it was some turn of phrase he recognised, though if his mother died thirty years ago, while he was still at university—My God! What am I doing, talking like this? There's only one rational explanation, isn't there? We've been sabotaged, and in a clever, ruthless manner. Much as I hate to say it, I'm driven to conclude that one of our own employees, the only people who have access to any point where a phony message could be injected into the system, must have taken a bribe, or—or—or *something!*"

"I can't accept that," Julie said firmly. "I think you must still be haunted by those idiots who wanted extra pay for taking orders from a woman, and they weren't working for us, but an outside contractor. No, our team has been together for years. We all have a stake in this. We're protected by patents up to our ears. There isn't another company within miles of duplicating our techniques. Once we start to let the licenses, we can all expect—"

"Aren't you talking as though the system works?" Hugh cut in, glacially.

"It worked perfectly, and well you know it! Right up until the Ada Wilkins thing! And would someone who'd taken a bribe to sabotage the demonstration do anything as silly as *that?* It's precisely the sort of thing to ensure we'd make a lot of extra checks. Which we did, didn't we? And wrote it off as freak interference!"

"Which recurred the very moment the circuit was fired up again!" Hugh rasped. "You can't have it both ways! Either it was freak interference, or it was deliberate. If the former, the system won't be functional until we figure out how to eliminate it. But because nothing

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

of the kind has ever happened before I'm inclined to the sabotage theory. Do you have a third suggestion to offer?"

Shaking her head miserably, Julie pushed away her plate.

"If you're going to be strictly logical about this," Philip offered around a mouthful of celery, "you must at least entertain a third possibility. I grant it's by far the least likely, but—"

"Mr. Graveney!" A shout from the corridor. They all turned. Bob Brownlee of the PR staff entered the dining room at a run, waving a notepad.

"Mr. Graveney, I just heard the radio news!"

"The last thing I want," Hugh retorted, "is to be told what the media are making of this mess!"

"Sir, please listen! What they said was that there had been a setback to today's demonstration of the ultraconductive cable. After returning to London—now this is the really interesting bit!—the minister instructed his lawyers to issue a declaration that there is no truth in the allegation that he used his position to exercise undue influence over the letting of nuclear power contracts at Mulrowdy and Point Glaze."

"But who ever said that he did?" Hugh countered blankly. "First I've heard about it. You, Julie? Ah—Mr. Nyanza?"

Philip said thoughtfully, "No, but . . . Tell me, Mr. Graveney. From where you were standing, could there have been another line coming up on the printer which wasn't visible to you?"

Hugh squeezed his eyes tightly shut. "Ah . . . yes! I hadn't thought of it before, but of course I was seeing each line only as it rose above the printing level."

Reopening his eyes, he looked at Philip with respect. "That puts a different complexion on the sabotage theory, doesn't it? If the motive isn't anything to do with us except incidentally, and the main purpose is to discredit Wilkins—"

"It also lends colour to the third possibility, which I was about to mention when this news was brought."

"That being—?"

"Well, that the message actually did come from his mother."

There was a stunned silence during which both Hugh and Julie simply stared at him. Fortunately they were again interrupted before either of them could explode. Di Pink came hurrying in.

"We've had Bill Ogden on the phone from Birmingham, sir. He swears there's no trace of any fault at their end. He just told his people to take half an hour for lunch, then he wants the printer here switched on again for more tests, this time with full peripheral memory connected. And one other thing, he said. Would you please tell him what kind of fault he's meant to be looking for because he doesn't have the—uh—the foggiest idea what's supposed to have happened?" Di looked apologetic. "I sort of censored the last bit, I'm afraid."

"Thank you," Hugh sighed. "So we'd better get on with it. Thirty minutes to define the impossible fault in the fault-free system. Julie, do you feel inspiration coming on?"

Glumly: "None at all. Even though Philip is cracking jokes to try and cheer us up."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"What jokes?" Philip murmured.

Julie stared at him. Then she uttered a harsh laugh. "Ah, that's your long line of witch doctors speaking! Save it for later, will you? We have a real problem on our hands, one that could spell disaster for Hugh and me and the company and everyone involved."

Compliant, Philip leaned back in his chair. "Very well. But perhaps an outsider's view may be helpful. I can claim to be moderately well informed about ultraconduction. I was immensely impressed by Schuyler and Sanback's original paper in which they laid the theoretical groundwork, and incidentally coined the name you've taken over. But unless I missed something their experiments at Toronto failed to lead to any practical applications. No more did all the subsequent work at labs where even well-known experts somehow failed to see the distinction between ultraconduction and superconductivity. Not until you came along, Julie, did any researcher I've heard about hit on what in retrospect feels like an extremely obvious difference."

Reaching for a virgin plate of salami sandwiches, Julie shrugged. "What's the point of being modest? I did happen to be the person who spotted a way of turning ultraconduction from a mathematical curiosity into a usable principle. What everybody else was looking for was a crystal-structure with zero resistance at ambient. I decided to look for a transmission mode that could be made self-compensating. And I found it! What it amounts to is—"

Hugh gave a theatrical cough, and Julie crammed her mouth with salami. Philip smiled wryly.

"Don't worry, Mr. Graveney. My country can't afford to build a factory in competition with yours. And I'm not in the habit of selling information I acquired in confidence. But once the news broke that there was a practical means of exploiting ultraconduction, the range of possibilities soon fined down to one. You don't manufacture your cable in the traditional sense. You grow it. It may not require repeaters or even insulation, but I swear it can't operate without being fed.

"In other words: *it's alive.*"

Hugh and Julie stared at one another. At length Julie sighed.

"Well, once the patent applications were filed it was inevitable that someone would read between our clouds of misleading verbiage. . . . You're right. The strands automatically grow booster-ganglia rather as though they *want* the signal strength to remain constant. You could say they make up their own minds about the need for reinforcement. So loss of information is negligible. Resistance isn't zero—how could it be?—but merely moistening the ends of the cable makes it two orders of magnitude better than anyone else has come up with."

For a moment Hugh seemed minded to expostulate, but decided in favour of smoked salmon and cream cheese with chives. Philip, his expression thoughtful, addressed Julie again.

"So you can handle signals in the millivolt or even microvolt range. You could—oh—take an EEG reading from a patient in a remote village and transmit it without conversion or amplification for a diagnosis to be made in a city hospital."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"That's an application I hadn't thought of. But it's the sort of thing that definitely should be possible."

"Except for one minor matter!" Hugh snapped. "The very first time we parade our stuff in public, we get a catastrophe!"

"It's conceivable," Philip said with deliberation, "that you may have got the opposite. I suggest you switch your printer back on. Now."

"Hm?" Hugh glanced at his watch. "There's no point. Bill Ogden said he was giving his people half an hour for lunch. There won't be anyone at the Birmingham end for another twenty minutes."

"That's precisely why," Philip said, and waited.

The puzzled silence stretched beyond bearing. At last Julie said, "Philip, if I weren't half-dead with fatigue I'd say you must be crazy. But being in the state I am I can't help thinking it's rather a good idea. Even if it isn't a *good* idea it is at least an idea, and I'm sick of sitting here and arguing."

She jumped up and headed for the door. Seizing a handful of bridge-rolls stuffed with sardines, as though the prospect of action had restored his appetite in full, Hugh followed her, and Philip—together with Di Pink and Bob Frownlee—tailed in their wake.

Arriving at the not-yet-dismantled dais on which the printer still stood, they discovered that Mr. Wilkins had indeed made off with the entire text of the message, extra line and all. Moreover, in his fury he had jammed the paper-feed. It took a minute or two to rectify that. Then, with the air of a suicide bound for Beachy Head, Hugh pushed the switch home.

For a long while nothing happened. He was about to turn away in disgust when—

Click.

Jaws dropped. They stared in horrified fascination.

Click.

Julie bent to read the two letters that had so far appeared, both almost concealed by the printing-head. And put the back of her hand to her mouth.

"If it reads A - D," Hugh said, folding his fists and closing his eyes, "I think I'll. . . . Does it?"

Click.

"Must be the low resistance factor," he went on with frantic optimism. "We're getting unpredictable signals from ambient sources. I bet there's a meteorological discontinuity between here and . . ." His false conviction failed him; he fell silent.

"But," Julie gritted, "it does say ADA. And to calculate the odds against random interference producing—"

Click. And then more clicks, with increasing rapidity, like an elderly person fighting free of overnight rheumatics on the way to breakfast. Clear as daylight the machine once again printed out the name ADA EMILY WILKINS NÉE CROSTHWAITE.

And stopped, the last three or four letters having slowed down again as though from exhaustion.

"Ah!" Hugh exclaimed. "I have it! Someone did plant a sabotage device along the route. But because it was only intended to operate once, it has a limited power-source. What we're getting is its last feeble flicker. Now all we have to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

do is track it down so we can produce it as evidence of what ruined today's demonstration. . . .''

His voice trailed away and he realized that both Julie and Philip were staring stonily at him.

''Do you know how to inject an extraneous signal into one of my cables without corrupting it?'' Julie snapped. ''I don't! And I spent all morning trying to figure out a way. Let me try another circuit and see what happens.''

Hugh threw up his hands and turned his back. But swung around again when a few seconds had passed.

''Nothing! So the gadget's exhausted, like I told you!''

Ignoring him, Julie went on trying different circuits. ''The peripherals are the likeliest, I presume,'' she murmured to Philip, who gave a nod.

''I always thought you were brilliant, but I never knew you were open-minded with it. Are you sure you didn't read my papers in—?''

She cut him short. ''Yes, damn it, I did read them! Purely because I recognised your name, not because I took them seriously. I was about to tell you this morning but you didn't give me a chance, and anyway that was the last thing I wanted to argue about. Now I have no alternative— Look!''

The printer, stiffly again, clicked, clicked, clicked. . . .

''Samuel Herbert Edwards!'' Philip read off. ''Hmm! You'd better get someone to contact whoever's at the Leamington Spa cemetery, check whether there's a gravestone with that name on. Obviously Mrs. Wilkins can't be the only person laid to rest there.''

''You must be involved in this!'' Hugh exploded. He seized Philip by the shoulder and spun him around. ''Is it some kind of diplomatic *coup*, a plot to get rid of a minister you don't approve of?''

Taken aback, Philip gaped at him.

''Answer me!'' Hugh stormed. ''You just said Mr. Wilkins's mother is buried at the Leamington cemetery. How could you possibly know? Even if it's true, and I doubt that, too!''

''Hugh, shut up,'' Julie said in a tone as chill as winter wind. ''You're getting hysterical. Philip knows because I told him. I found out about half-past nine this morning. I would have told you, too, if you hadn't been so wrapped up in your grand tragic routine!''

At which point the printer produced another name: Mavis Jane Edwards. Over her shoulder Julie said, ''Philip, I'd never have dreamed it possible, but—but I think you must be right.''

''Which means,'' Philip said, unable to resist a grin, ''that each of us is in distinguished company. One presumes we've hit a husband and wife buried in the same grave.''

''You think physical proximity may be a crucial factor?''

''*A priori*, not at all, but until we know more about the volitional capacity of an individual in the post-mortem state I think we'll have to assume it is significant. I don't know as yet which alarms me more: the notion that post-mortem contact is an elitist phenomenon, or the risk that it may become so general that we're overwhelmed by swarms of strangers who just happen to be around.''

''You've thought about this much more than I have, obviously,'' Julie

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

said. "Let's go and crack some champagne. We need it both ways, either to celebrate one of the great days of history, or to cushion us against the discovery that it isn't."

"Admirable logic!" Philip chuckled, and took her arm.

"Stop!" Hugh cried. "Stop this—this New Age nonsense! Either I'm out of my mind, or you are. I could swear you're claiming to have established contact with the dead!" He set the heels of his hands to his temples and held tight, as though afraid his head might take off and fly away.

"Near but not exact," Philip said in the most judicious tone he could contrive. "Rather you should say they have finally been given a reliable channel whereby to contact us. Which is why Julie is going to win not only a Nobel but also several other prizes not yet heard of which will be invented especially so they can be given to her. Julie dear, what was that about champagne?"

"We laid in a big stock for today's visitors," she said. "With luck they'll have forgotten to take it off the ice."

Unable to think of anything else to do, Hugh helplessly accompanied them back to the dining room, where the remains of the almost untouched luncheon were being cleared away. The champagne, though, was still cold, and by the time it was opened and poured he was again in control of his wits.

"What the hell is going on?" he pleaded. "Julie, for pity's sake explain!"

"Philip is the one to put you out of your misery," she answered. "He's been half-expecting this."

"Half?" Philip echoed ironically. "One-tenth of one percent would be more like it. But at least I hadn't ruled out the chance entirely, which is what I suspect everyone else had done."

"Apart from those it had never occurred to," Julie supplemented.

"A fair comment." Philip sampled his wine and raised his eyebrows in approval. "This was a bright idea. . . . Yes! Mr. Graveney, among the failings of people like you—excuse my being blunt, but it's the truth—among the failings of people like you in the technically advanced countries is the bad habit of taking it for granted that no serious research can be carried on without extensive lab facilities and lots of power and all the very latest shiny doodads. But surely by this time we ought to have admitted that this isn't the whole story of human existence. Of all the most important inventions, something like nine out of ten have been made with the sort of materials you can find on a backward farm like the one where I grew up. In order to conduct a project that generates useful results you don't need a billion-dollar budget. I'm not decrying the benefits of modern technology. That would be silly, given the enormous advance represented by the Underwood cable as compared with a spiderweb, even one spun across the actual skull of the person you want to get in touch with—"

But Hugh was holding his head again and rocking back and forth. At any moment, plainly, he might begin to moan.

"There doesn't seem much point in going on, does there?" Philip sighed to Julie.

"You could try spelling it out for my

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

benefit," she countered tartly. "I told you, I read your papers on this subject. I don't remember any reference to skulls and spiderwebs!"

Philip had the grace to look abashed. "No, I felt it advisable to omit that bit. And we're still evaluating the pharmacological constituents of the mix they gave me when I first got in touch with my five-times-great grandfather. It works, but we're not sure exactly how. Dreams, of course, are such an unreliable channel—although whether your cable is going to be a genuine improvement must ultimately depend on that problem I already mentioned: the question whether it's only a few very strong personalities who can reestablish a link with the world they've left, or whether it's a universal accomplishment. Mark you, the means available must exercise a determinate effect. An Assyrian writing in cuneiform, or an Egyptian accustomed to hieroglyphics, couldn't take much advantage of a printer using modern Roman letters. So it will remain for quite some time an open question whether any ancestors are still around from that far back. And of course the majority of the species has always been illiterate anyway, which circumscribes a further experimental area."

"What if one were to feed the input through a computer equipped with a state-of-the-art graphics package?"

"It might well produce results. At least it would provide a means of testing my theory that, whatever form of energy the ancestors use to maintain themselves in their version of 'being,' it has to be cumulative, so the more people who have lived, the more likely it becomes that the residual portion of their identities will be able to affect material objects, even if only electrons. The appearance of a message the first time an ultraconductive cable was put in service is indicative, to put it mildly. But—"

Julie was holding up her hand. "I just remembered. Earlier you said about my cables, 'They're alive!' Do you think that can really have anything to do with it?"

"One shouldn't rule it out. But you mustn't get the idea that this is any more than speculation, though it's true I was taught to use the traditional dream-path for questioning the ancestors when I was five or six, so you might say I've been researching it for thirty years. But the evidence is still tantalising rather than conclusive."

Hugh sat abruptly upright. "What? After all that you admit you don't really believe the twaddle you've been spouting? Oh, this is ridiculous!"

Philip, summoning all possible patience, said in a level voice, "Mr. Graveney, however satisfied I may be that the information I received in a dream last night originated in the psyche of someone physically deceased, there is no way I can persuade you to believe me short of generating and displaying a signal that corresponds to the data being transmitted. True? Of course. Until the process can be objectified you're entitled, or anyone, to claim it's the result of self-deception. Or even of signals generated within my own brain from some sort of mapping of my *idea* of the person I imagine to be talking to me. Which is a possibility I examined in a couple of the papers Julie didn't want to argue about this morning!"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

She was about to retort when Di Pink came running in, carrying a phone which she set down at Hugh's side.

"Sorry to interrupt, sir, but this is urgent. Scotland Yard's on the line. They're sending detectives here to investigate a criminal libel they claim we've made against Mr. Wilkins."

Hugh shook his head giddily. "Does that mean they're investigating us, or him?"

Di looked embarrassed. "I'm afraid I didn't ask."

"Oh, well . . ." Hugh reached toward the phone. Julie rose with an air of decision.

"Tell them not to expect to find me here," she said.

"What?"

"Nor Philip. Come on!"—seizing his arm. "We're off to Leamington to study gravestones. Aren't we?"

"You made a note of the names?"

"Of course. And I've left the printer set to automatic test scan pattern, so it'll sample all the channels in turn and print out from any which is carrying a message. That should do it. Provided, of course, Bill doesn't fire up the regular signal again. Di, be a love and warn him not to until he hears from me. And tell him to join us at Leamington ASAP."

Baffled, Di nodded and made the appropriate notes.

His hand still an inch from the phone, Hugh pleaded, "You can't leave me to handle all this on my own! We're not only running the risk of going broke now—we've got the bloody police on our heels!"

"Broke?" Philip said. "Mr. Graveney, you still haven't caught on, have you?" He leaned forward, planting his palms on the table facing Hugh. "I'm 90 percent certain now that my suspicions are going to be confirmed. That means you can rely on selling several hundred miles of Underwood cable to me immediately. And it doesn't stop there. Didn't they tell you why Mr. Oshihara travels everywhere with a chaplain? It's because he will never take a business decision without consulting his honorable ancestors, whose judgment he respects above his own."

Hugh's jaw dropped, but a sparkle began to flicker in his eyes.

"Oh, wow," Julie said faintly. "I hadn't worked it out that far, but—Wow! Only it's going to be a terribly different world, isn't it?"

"Difficult and maybe painful to adjust to," Philip agreed soberly. "But it will have its compensations. Doubtless they'll appeal mainly to people like me, still accustomed to relying on the advice of the elders, but I can see how it may well have advantages in the advanced countries, too. Has it not been well said that there are two kinds of fool? One says, 'This is old, and therefore good.' The other says, 'This is new, and therefore better.' For the first time we may have the chance to reconcile these points of view."

"And not a day too soon," Julie said. "Come on. My car's in the park out back. You'll have to drive—I'm much too tired—but we should reach the cemetery in at most an hour."

Clapping Hugh reassuringly on the shoulder, Philip followed her towards a brand new version of the Universe. ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Probability Zero

UNCERTAINTY EXCHANGE

David J. Strumfels

Wilson Greggory, the new NASA administrator, surveyed his staff and wondered whether they could handle what he was about to unveil. Most of them were competent, but they were not accustomed to original thinking. There was Frank Leyter, the chemist who'd been a college dean before joining NASA; Janet MacHollister, the CPA who'd been in more federal agencies and bureaus than the average senator had even heard of; Colonel Garrison Lock—the man probably didn't go to the bathroom without a schedule; and Bill Freeser, the astronaut who'd found a new home for the genius at organizing which had made so many shuttle missions "successful"—i.e., slightly less in the red than they would have been.

"It is time to deal with the crisis this country finds itself in," Greggory started. "To this end I've hired a consultant who specializes in these matters." A short, plump, red-headed woman entered the room and made herself the dominant force in it. "Some of you may know Dr. Neumann," he said. "For the last several years she has been helping government agencies in these times of limited budgets. Without further introduction . . ."

Dr. Neumann smiled at the blank

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

faces. "Let me come straight to the point. I assume you've all heard of the Uncertainty Principle?"

An immediate guffaw broke from her left and she turned to Leyter. "The Uncertainty Principle says that certain pairs of measurements on a system cannot be made simultaneously without an uncertainty in one or both of the measurements. For example, if you know exactly what the position of a particle is you cannot, at the same moment, know anything about its momentum. Energy and time are another such pair: as Dr. Leyter knows, the lifetime of an excited state can be measured by the width of its spectral band; very short lifetimes give rise to broad bands.

"One of the remarkable things about the Uncertainty Principle is that it permits events to happen that are otherwise forbidden. A radioactive nucleus, for example, doesn't have enough energy to decay; it temporarily creates the energy out of nothing by decaying so swiftly that the uncertainty in its energy is greater than what it needs."

"Excuse me Dr. Neumann," Bill Freeser broke in. "It's, ah, not that I wish to be difficult but I assume there's a point to this."

Neumann nodded. "The point is money. Which you spend at the rate of about twenty billion dollars a year, or forty thousand dollars a minute. The point is, a *lot* of uncertainty is involved by spending money at that rate. If you spent it faster the uncertainty would be greater still."

"I don't understand," MacHollister said. "How can we spend our money faster? We'd get audited if it didn't last the whole year."

Neumann looked at Greggory, who shook his head. They'd both known it wouldn't be easy. "Look at it this way: do radionucleides get audited by spending energy they don't have? They don't because they use uncertainty to create the energy. We can do the same thing; we can create additional funding by spending money so quickly that the resulting uncertainty covers what we create. And it's real money too—once it gets circulated information about its past is lost to entropy."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

She waited for the protests. The wait was short. "There's something wrong here." Colonel Lock looked at Neumann as though he was searching for hidden weapons. "You can't create energy out of nothing. That's against some kind of law, isn't it?"

"Are you telling me radioactivity is a fantasy?" Neumann shot back. "Besides, money most certainly can be created out of nothing—I know a few millionaires who've made their fortunes just that way. All I'm doing is employing a well tested principle of physics to do it."

"The bottom line is that it works," Greggory ended the discussion. "Which is why I am making Dr. Neumann's recommendations the fiscal policy of this agency. America is going to win the race for space by spending out of the pockets of uncertainty. The Japanese may have the greater budgets and national will, but Yankee ingenuity will win again. I expect to find your ideas on how to implement this policy on my terminal by tomorrow morning." He turned to Jerry. "That concludes this week's staff meeting. Everyone is dismissed."

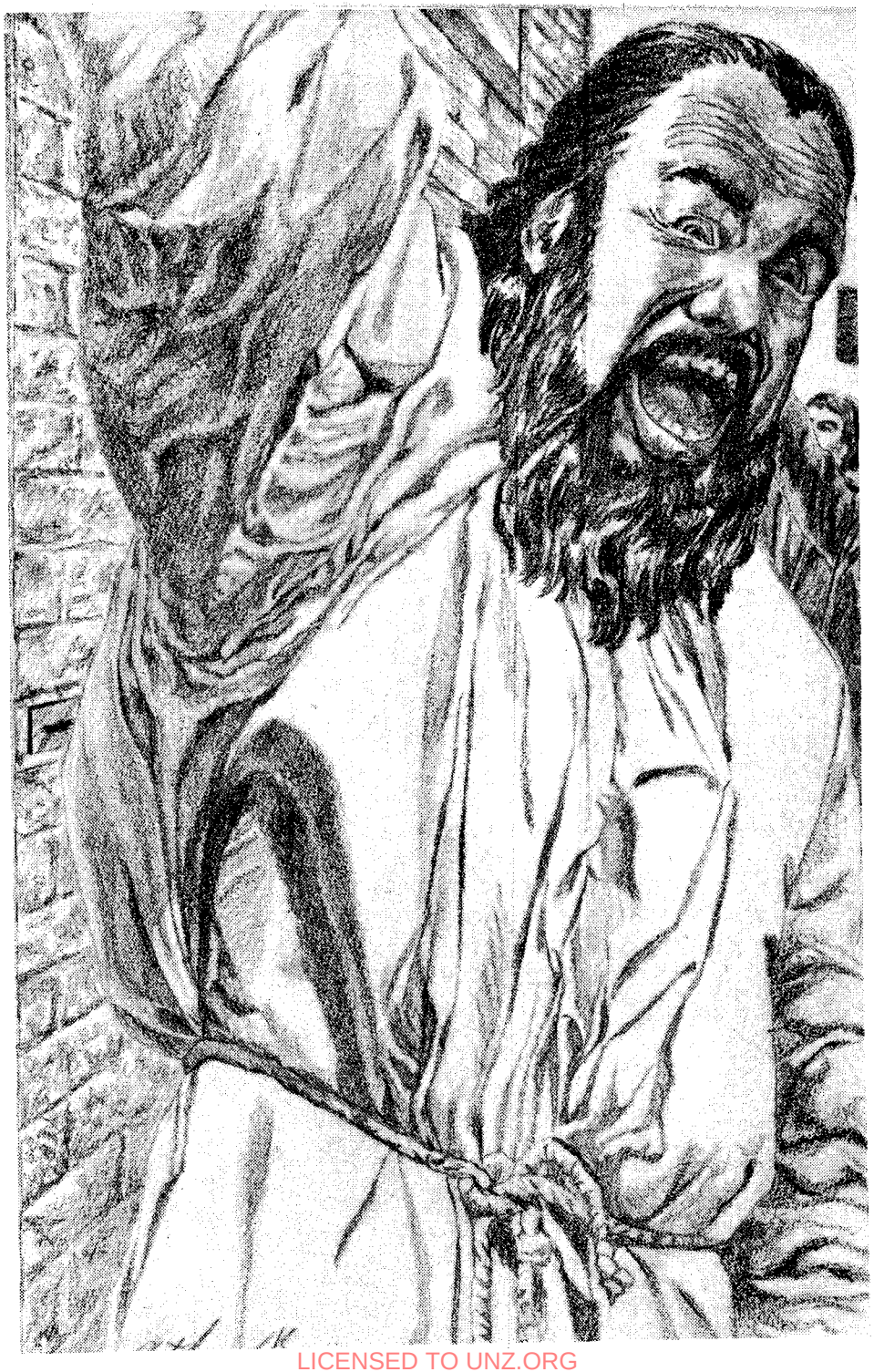
When they had left he turned to Neumann. "I'm waiting," he said, his stomach already churning. He didn't wait for an answer. "I know. The Japanese will eventually find out too, and then we'll be back at square one. But at least we'll have had the jump on them for a while."

This time Dr. Neumann was shaking her head at him. "The uncertainty increases as the spending rate increases." She looked at him, and saw he was still blinded. "The spending rate in turn is inversely proportional to the size of the currency units."

It struck down on Greggory with all the irresistible tide of destiny. "You mean—oh God. Oh God." He buried his head in his hands. "I hadn't thought about that. We're finished. America is finished."

Neumann nodded grimly. "Damnable thing, exchange rates. How many yen is it to the dollar these days, anyway?" ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

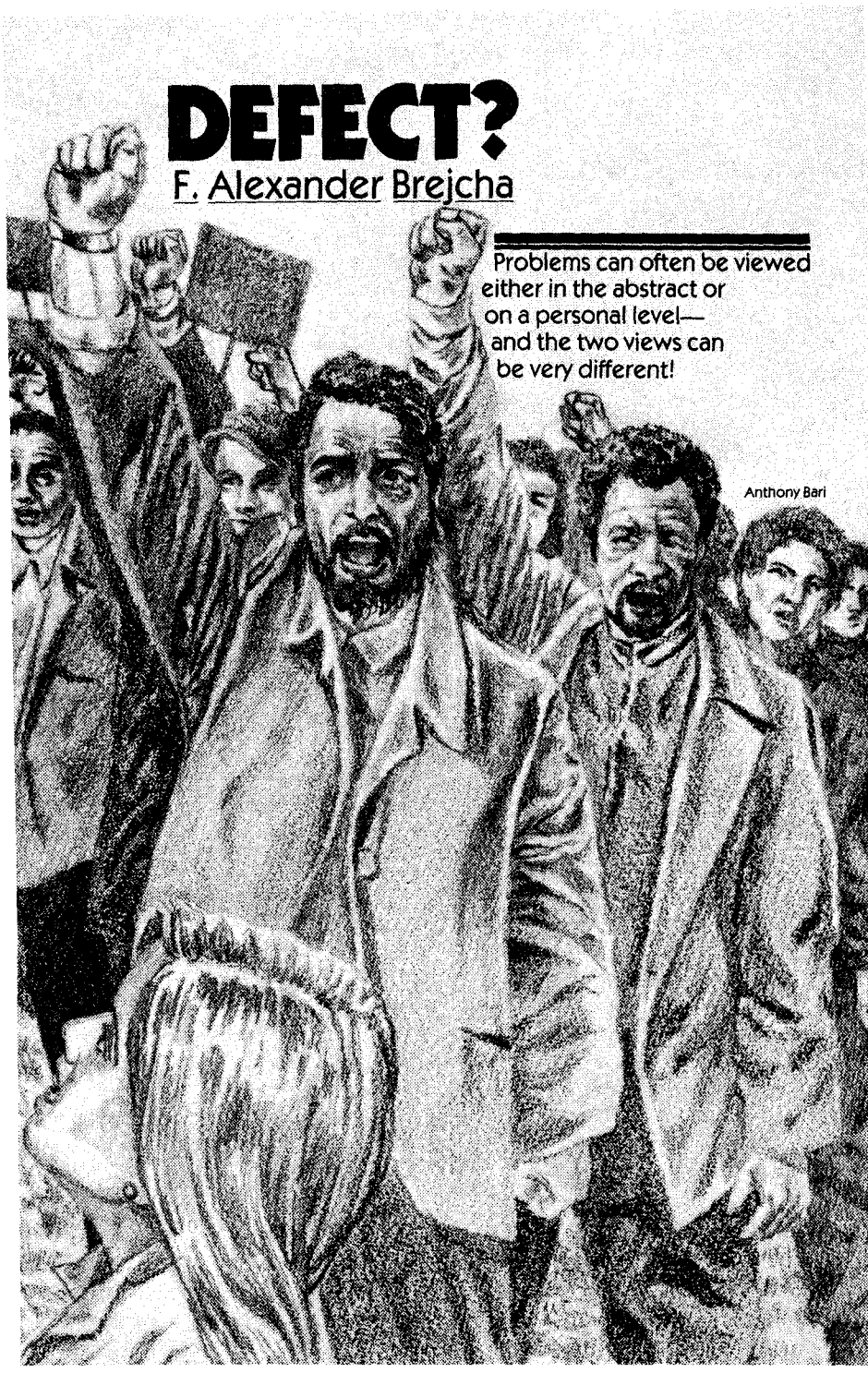


LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

DEFECT?

F. Alexander Brejcha

Problems can often be viewed either in the abstract or on a personal level— and the two views can be very different!



Anthony Bari

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Dr. Warner?"

"I said extra ketchup." She glared at the servo-cashier and then grabbed her tray as another packet popped out.

"I'm sorry I'm late, Dr. Warner, but it couldn't be helped."

She turned and looked up at the six-foot man towering over her as she walked away from the counter and headed for an empty sun-washed booth by the window. "Late?"

"I'm Bob Meyer. Your lab assistant told me I'd find you here." He followed her. "I'm Dr. Meyer."

"So?"

"You called NanoSolutions and asked for a medical specialist to help you on a research problem?"

"Um, yes I did. I'm afraid I forgot. I expected you several hours ago and when you didn't show, I got tied up in double-checking some results—"

"And then you got hungry." The corners of his mouth twitched in a faint smile.

"Well, I hadn't eaten all day—"

"You're blushing!" He waited for her to sit as they reached the booth. "Why?"

She put her tray down on the table and settled into a chair. Then she zipped open the pouch of french fries and nibbled silently on a couple of them as she tried to think of an answer that wouldn't sound stupid.

He sat down and studied her across the table. "I don't mean to make fun of it. It's refreshing. Blushing seems to be a lost art these days."

"Hey, it's OK. I guess it *is* a lost art. But you see, it's something my mother taught me. Never fails to get the guys intrigued. . . . Am I shocking you? Don't worry. It's just real hard to be formal and proper when sitting in a McDonald's nibbling french fries." She saw that he was suddenly the one blushing and grinned.

"Well, it seems that I'm not alone. Either that or there's a new contagious disease out there."

"No, I, well—"

"Relax." She forced herself to look serious. "You asked what made me blush. I'll tell you. I was doing karyotyping on a C.V.S. specimen—"

"C.V.S.?"

"Chorionic Villus Sampling. A sampling technique to study fetal tissue for genetic—"

"OK, I know. It's just been a long time since I did any clinical work."

"Well, I was looking at the chromosomes—"

"Oh, I know!" He laughed. "Sorry to keep interrupting, but I'll bet I can guess." He reached for her french fries. "May I?" She nodded and he pulled out a couple of long golden strands. He laid them down side by side and pressed them close in the middle and spread the ends out. Then he took two more fries and repeated the pattern right next to the first. "Voilà, a female. Two X-chromosomes. Association complete, even if in reverse. Especially if you had the lab window open, which on a nice warm June day like this, I'll bet you did. The hospital's right across the street and there's nothing like the smell of french fries drifting in to tease your nose when you're hungry—"

"Popcorn!"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"You're right. That's worse. You don't even have to be hungry for that."

"Please! You're making this real tough." She eyed her hamburger pleadingly.

"My apologies. Eat. I'm going to order some, too, and if you don't mind, join you."

"Be my guest. You already have an appetizer. But I warn you, I don't eat and talk well at the same time, so please let me finish before we get down to business."

"No problem. I'm getting hungry looking at your food."

She studied him as he got up and grabbed the fries from the table, munching on them as he went over to order. She had almost forgotten that he was at least six feet tall. While he had been sitting across from her, they had been almost eye to eye and she had felt entirely at ease—he had been so casual and accepting of her. He was also quite good looking, she decided. He had wavy brown hair that was slightly windtousled and soft grey eyes that had met her own directly when they had been laughing together about the smells. And he had a really nice mouth and a sexy smile.

She unsealed the burger pouch and pulled out the hot sandwich. While she waited for Meyer to return, she chewed on the hamburger absently, washing it down with sips of lemonade.

He was soon back with his order and they ate silently, eyes meeting and then dancing shyly away.

When he saw that she was done, he pushed his tray away and leaned back, dabbing his mouth with a napkin. "I started to explain why I was late. Well, I was trapped by a bunch of protesters outside our offices. Some religious fanatic has them all riled up about interfering in 'God's designs.' Big guy named Gabriel . . . " He was frowning. "They really jam my nerves when they spout on like that. Sorry. But that's why I was late. What did you need help with? Something to do with the C.V.S. sampling?"

"Exactly. What do you know about Turner's Syndrome?"

"Turner's Syndrome . . . it rings a bell, but there are so damn many orphan diseases that I can't remember them all."

"It's a congenital disease . . . a birth defect, if you will. I hate that term, even if it's technically true. It's limited to women and is the result of a missing or deformed X chromosome . . . God! I feel like I'm back herding interns again. Anyway, the primary signs, symptoms, whatever, include impaired sexual development, infertility, and stunted growth. And I see your eyes going wide there. What's up?"

"I couldn't help wondering if—"

"If I have Turner's? Sure do. It's no . . . big deal. I'm four-foot-six and seventy-eight pounds, in case you wondered. And don't worry about asking any questions. I don't mind. And since growth hormones cause problems later on in Turner's patients, I guess I don't mind being small, either. But I still maintain I'm not defective—"

"Not in the least. It's starting to ring some bells now. There are . . . two types?"

"Uh uh. Three types. Classic, like mine—"

"You're a classic, huh?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

He smiled and she looked down, feeling herself blush. "Afraid so. All us classics are missing the second X chromosome totally." She had saved a few long fries and cleared an area of the table to lay down a duplicate chromosome model to his earlier one.

She looked up. "As you said. Voilà, a normal female gene with two X-chromosomes." She removed one pair of fries. "Here's a sample of my problem. Only one X-chromosome in a cell."

"Mosaic Turners also have some like that, don't they? Some normal and some single-chromosomal ones?"

"Exactly. I have a confirmed sample in my lab. The one I was talking about."

"What's the third kind?"

She replaced the second pair of fries, but then took a bite out of one of them. She laid the tattered remainder down next to the single fry. "Isochromosomal Turner's. In these, the cells divide abnormally and all or a portion of one of the chromosome arms is missing or deformed. A little simplistic, but close enough for now. I'll upload material to your system if you give me an access number."

He pulled out a business card and passed it over. "Any major complications with Turner's? I don't remember."

"Other than those I mentioned, not really. Personally, I just have to take an estrogen supplement. Some Turner's have more problems. But for most, the medical angle isn't the issue, usually. It's the way people look at us like we're little kids. It gets to be a drag when you're always being patronized. And it's real tough to get a decent date. But hey!" She straightened and grabbed the last fries and twisted to dump them in the trash. "I don't have time for moping."

"You're right, Dr. Warner . . . may I call you Barbara?" She nodded. "Well, Barbara, as much as I'm enjoying this, there was a reason you called me. So let's do this right. Hi, I'm Dr. Robert Meyer from NanoSolutions—Bob. I understand you're looking to adapt our experimental nanorooters for your own research." He gave her a wide grin and took her automatically extended hand and gave it a careful gentle grip.

She squeezed his hand back deliberately, seeing his surprise. His own grip tightened in response to a more normal handshake as she explained. "I had an older brother who felt it was his inalienable right to torture the shit out of me. I had to work out in self-defense."

"But I'll bet nobody else dared try it. I have a younger sister and I seem to recall something similar."

"You got it. But you're right, I called you for a reason." She tucked her legs up under her and sat Indian-style so her legs didn't dangle. For a second she picked at a loose stitch on her jeans as she brought her mind back to the reason she had called him.

"I've been studying Turner's for almost three years—since winter '92 when I got this job—trying to come up with a way of preventing it. But I have a problem. The critical period when cell damage occurs is from conception to the sixteenth day of gestation, and in order to prevent Turner's from developing, we have to catch it during that period. But C.V.S. isn't possible until nine weeks, and amniocentesis not till four-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

teen weeks or so, so both of these tests are too late."

Bob leaned forward and propped his chin on clenched hands. "Let me guess. You want to use nanorooters to scan and then sample real early. With microscopic scanners, we can study fetal cells right away with no risk of damage, and then sample just as safely later on."

"You catch on quick. That's it. To start with. Then—"

"You don't expect—"

"No, I know it's too late to help her. By now, she's close to ten weeks old and she probably won't even survive. Less than 2 percent of these Turner's fetuses go to full term because of fluid buildup in the tissues." She felt her eyes burn and hoped Bob didn't notice. "But I'm almost finished getting a testing program together, and once that's done, we can use samples from this child and her father to try to develop ways of repairing chromosomal damage. And we'll use samples from any other Turner's girls who show up in the meantime. We can't possibly do anything for them, but it'll give us base-line data on fetal cells and a chance to refine the techniques."

He pulled out a small pad and jotted down a few notes. "Go on."

"Well, what I need from you are nanorooters that will go into the individual cells with parental chromosomal material and integrate it with that of the damaged cells to repair them." She shook her head. "It still amazes me when I think about what those microscopic robots can do. I see papers all the time now on cases where they're used for heart-surgery from the inside and spinal-injury repairs."

Bob nodded absently. "Yeah, amazing." His pen tapped the pad. "This ought to be interesting. And it shouldn't be too difficult. We're already using nanorooters for genetic analysis and gene-splicing with animals, so we've had a little practice." He looked over at Barbara curiously. "Do you have human studies approval? We'll have to have it since we'll be needing further samples."

"Finally. It took a while, but I just got the green light from the research committee. I think they got sick of me. I've been a bitch. I had a hard enough time just getting permission to screen the samples." She saw the shadow of a frown on Bob's face. "What's wrong?"

"What's the prevalence of Turner's?"

"It used to be around 1 in 2,500 or so births, but it's on the rise. Now it's up to 1 in 1,500. Why?"

"And you said the first sixteen days are the critical ones?"

She nodded, getting irritated as he kept ignoring her questions.

"So, how many cases do you think we'll be able to prevent? Ultimately. That's assuming we get this technique refined, of course. Remember, you have to find out in those first sixteen days whether a pregnant woman, who may not know she is pregnant, is carrying a Turner's child. More like in the first week if any repair work is to be possible."

"And I just realized that there's another question I've been ignoring: who will pay for all the testing and development work that will be needed? I was lucky to get a grant to pay for the pilot-research, but what about after that's done?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Bob nodded, and a faint smile played on his lips.

"What the hell are you grinning about?"

"Relax, Barbara. I just want to point out something."

"What do you mean?"

"Can you take some constructive criticism?"

"Sure."

"Good. I don't want to be negative. It's just that you've lost sight of what it is you're doing. And what you could be doing. You're screening for a type of birth defect, and trying to figure ways of detecting and correcting it while it's still early enough to do some good. Right?"

She folded the burger and fry pouches together, activating the enzyme Disposa-Strips and then reached back to drop them into the trash can behind her. Bob was waiting patiently as she turned back to him finally.

"You're not just talking about Turner's, are you? I've been so focused on my own problems that I've been missing the fact that there are a lot of other birth defects out there. Worse ones, too!"

"Exactly. If you want to get anywhere . . . if *we* are to accomplish anything, we've got to go after birth defects as a whole. Turner's will be easy to correct if we put our heads together. The others will be harder, but what we learn from this will help. We have a go at it from a broad base so we can drum up a media campaign to encourage regular pregnancy and fetal cell testing. With that, we can improve our chances of detecting and testing a large percentage of early pregnancies. If they're used regularly, the new test kits give an indication within only a few days of conception—"

"They're also cheap, accurate and idiot-proof now. But can we make that kind of broad claim?"

Bob leaned towards her. "For marketing purposes we'll have to. We'll explain that during the research stage, Turner's will be the primary focus. Then we'll go on to say that what we learn from that will be applied to other congenital disorders. But in the beginning, we'll have to lay a wider claim down—"

"With a good use of qualifiers."

"Right." Bob flashed her an exaggerated look of innocence before getting serious again. "In that case, we should be able to lock in some decent funding. . . ." His voice trailed off and his eyes unfocused a moment. "I'll bet we can get some major support from a maker of pregnancy kits. I know! We'll hold a bidding. Let them bid for the rights to be the sponsor of the testing and research. It would be great advertising. There are at least three manufacturers of test kits out there." He scribbled down a few notes on his pad and looked back up.

"I may also be able to swing in a grant from Gene-Tech Laboratories. One of our divisions is working on a contract for them over at their Delaware Avenue plant. Let me get back to my office and start making some calls while you get permission to contact the parents of our subject . . . the girl we'll be studying." He nodded and snapped his pad shut. "I'd better get going, though."

Barbara reached out and touched his arm lightly. "You know? I think we'll work well together."

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"I think so too." He put his hand over hers for a moment, covering it warmly. Then he let go and stood up. His face was carefully neutral, but she swore there was a speculative glint in his eyes as he waved goodbye and disappeared.

She tried not to laugh at the irony of it. Why was it invariably the basketball-player types who were attracted to short women? Men closer to her own size always seemed to be on the prowl for tall women.

She shook her head and put aside her reaction to Bob as she got up to head back to the hospital. It was time to find out who the parents of the Turner's child were.

"What was that name?" Barbara sat in her office the next morning, staring at the phone-image of a young administration clerk. She thought she had heard him wrong. It couldn't be!

He repeated the name: "Gabriel, Victoria Gabriel. She said it would be all right to release her name. But we'll contact her for you." His image leaned close. "Is there a problem?"

"I don't know. Do you have any information on her husband?"

"His name is James Gabriel, that's all I know. Apparently they are separated."

"OK, thanks. Go ahead and contact Mrs. Gabriel. When you get her, though, let me tell her why I'm calling." She gave the clerk her cellular number and disconnected, wondering about the name. It was a pretty unusual one and it had stuck in her mind. Was it the same Gabriel who had been protesting outside NanoSolutions?

She turned to her terminal, feeling a bit guilty.

Before she had finally yielded to her parents' desires for her to follow them into medicine, her major had been computer science. She'd been good, but it had bored her. Now, as she turned her terminal on, she appreciated her earlier training. She thought back to her hacking experiments in school and muttered a soft apology to the air.

The medical records' master file was first. Tracking down Mrs. Gabriel was easy. But James Gabriel's medical records were nonexistent. Finally, she got a line on him through his wife's records. But everything was keyed to other, outside, databases.

So, the next step was to branch out.

At first, she was clumsy and got kicked off system after system, but soon enough the old tricks came back. She gradually built up a picture of Gabriel, beginning with driver's license and passport. And a change of address only a week old. He and his wife had separated that recently? Because of the child? More and more interesting.

She checked further, looking over his vital statistics, and suspected she had the same Gabriel Bob had complained about. His records gave his height as six foot three and with a weight of two hundred forty pounds. That would fit with Bob's description of a "big guy." Not surprisingly, he worked in construction. And he was between jobs since his union was on strike. Time on his hands, and a tight financial situation. It all seemed to fit.

Armed with more information and key-words, she branched out into other systems and built up a picture of Ga-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

briel's family to learn more about the forces that had molded Gabriel: the potential father and the man.

His parents had been Christian Scientists who did not believe in medicine; only in faith-healing. His father had been a minister in the church. Now everything made sense. Studying further, she discovered that Gabriel's younger brother had died because his parents had refused to get medical help when three-year-old Peter had developed croup following a bad case of flu. The croup had progressed to epiglottitis and the boy had choked to death. With a hospital only minutes down the street!

James Gabriel had been only four at the time. His father had continued with church work after Peter's death and Barbara cringed as she pictured what that must have meant.

If the death of a son had not swayed the elder Gabriel's faith, he must have buried himself in church doctrine to avoid accepting blame for Peter's death. He had probably brainwashed James to accept the church and nothing else. And he had probably made sure to emphasize the evils of medicine to his impressionable, four-year-old son!

No wonder the grown-up James Gabriel was out there protesting against NanoSolutions. And it made sense now that he and his wife had separated. She had probably wanted all the benefits of modern medicine for her child—which would have gone against all of her husband's beliefs.

Barbara shut off her terminal and twisted back and forth on her chair slowly, trying to think how she would approach someone like him. It wouldn't be easy. She would have to prepare herself.

Then a call from Bob interrupted her. He asked her to come over to his office. He had some good news, he told her. From his excited expression and voice, she suspected he had managed to track down some strong support for their project.

Putting the problems with Gabriel away for the moment, she grabbed her keys and locked up the lab. Bob had told her the coast was clear and Gabriel's protesters had not shown up that morning, so she should have no problems getting in to see him.

Late-morning traffic in west Philadelphia was snarled as usual. As she crawled along Walnut Street, she saw a crowd up ahead. A group of sign-bearing protesters were gathered outside the scrubbed red sandstone monolith of NanoSolution's main building.

A slight churning started in the pit of her stomach and she decided that maybe it hadn't been such a good idea to come over here. Obviously Gabriel's protesters had just been sleeping late. She looked over to see if she could get out of the turning lane that led into NanoSolutions lot, but traffic was jammed and no one would let her into the next lane.

Then one of the protesters spotted her and pointed, and the whole crowd turned and started towards her, signs held high under angry faces. Her hands tightened on the leather lacing on the steering wheel. As she shifted on the booster-cushions under her, she muttered a quiet prayer that once she got to the lot there would be a security guard

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

there to help her. She drove on, her stomach churning and moving into high gear as the protesters surrounded the car. But they parted in front of it as she pulled into the lot, no one touching it. Feeling a bit more secure, she parked in one of the visitors' spots. Swallowing nervously, she opened the door and got out.

Momentary confusion battled with hostility on the faces of the protestors as they got a look at her.

She stepped forward and they began to give way. She had to smile and her fear eased. For once, her size had an advantage. But then a tall figure wearing a plain brown robe pushed out from behind and confronted her.

"Who are you and what is your business in this devil's lair?" She barely reached his waist as he stepped forward and blocked her way to the front door. He knelt and stared at her, curiosity and revulsion alternatingly flashing across his face. "And what manner of abomination are you? You're no dwarf, but a woman in a child's body." His voice was a booming challenge that rang out over the parking lot.

"With a charming line like that, you've got to be Gabriel. I don't exactly appreciate that crack about a child's body, though. I may not get a job as a Maidenform model, but I think I'm pretty obviously a woman. As for who I am, I'm a doctor researching a way of preventing birth defects. And I am here because NanoSolutions is helping me."

Gabriel rocked back on his heels. "You? You're in league with this tampering with God's will?" He rose, towering over her and stepped closer, forcing her to back off. "How dare you interfere in His plan and corrupt His creatures?"

As he moved in, the others crowded around and she was suddenly scared again. She had blown it. She should have known from what she had found out that he would react like this. And he was getting the rest of the crowd worked up.

Then a tall, broad-shouldered figure broke through the press of people, grabbed her hand, and pulled her out from in front of the mob before anyone knew what had happened. She was quickly whisked inside the cool hallway of the main building, more carried than anything. As the heavy glass door hissed shut behind them, the protestors' angry muttering was cut off. She breathed a deep sigh of relief. Outside, Gabriel's people were almost invisible on the other side of thick smoked glass and she relaxed.

She felt something cold touch her face and jerked back until she realized she was just brushing against the leaves of a huge philodendron. Feeling a little silly about being scared by a plant, she realized she was gripping someone's hand fiercely and looked up at her rescuer—only to see Bob looking down at her with a big grin on his face.

"Sir Lancelot, at your service, mademoiselle." He bowed formally and with his free hand swept a nonexistent hat off his head with a flourish.

She laughed and curtsied in return. "Thank you, good sir."

"Just doing my bit to rescue a fair maiden in distress. You really do have quite a grip, you know. Do you always hold . . . " He stopped, actually blush-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ing a little, and started to change the subject. "Why—"

"Oh no you don't." Barbara kept a grip on his hand. "Finish your question." She grinned maliciously, seeing his face turn a distinct red that matched the rosewood paneling of the wainscotting in the hallway.

"Do you always hold your men so tight?" he finally got out, not meeting her eyes.

She giggled. "You're damn right. All of the many, many men that come trooping in and out of my life. . . ."

Bob's hand tightened around hers as she fell silent. He turned her around to face him. "I'm sorry, I guess I pushed the wrong button—"

"No, don't apologize. It's not your fault. It's just that your question hit home." She studied the ornate horn buttons on his jacket for a moment. "You see, there have only been three men in my life" She turned away, leaning against the cold wall behind her as she looked out through the heavy smoked glass door at the marching figures outside. They seemed so far away. Only a muffled cadence from their chanting filtered in. "Just three. One took off when he found out I couldn't have children. And the one before that met a nice, *tall* model and decided that he preferred dating someone he wasn't ashamed to be with."

"And the first?"

"He was a sweet man. It was my last year of residency and he was one of the surgeons in the shock-trauma unit. I was in medicine, not surgery, but we met at a dinner and started seeing each other. It was a good match. He was only five foot three. Then in '91, he went to Kuwait as part of a medical response team and he was killed. In an accident. The chopper that was taking him from the carrier to Kuwait City had a malfunctioning tailrotor and it crashed. . . ." She shook her head. "I don't believe I'm telling this to a perfect stranger—"

"Well, I don't know if I'm perfect. But I'm OK. And I care."

"Thanks." She relaxed and studied his face. His eyes were concerned and interested.

"I'm sorry if I seem to be prying, I guess I'm just a little surprised. Only three? I mean you're young—"

"Not that young, but thanks. I'm thirty-five."

"But you're attractive, intelligent, accomplished. I can't understand why—"

"Why I've only had three lovers? Getting kind of personal, aren't we? No, that's OK. For some reason, I don't mind talking to you about it." She looked down briefly. "What was *your* first reaction when you saw me? Even if somebody obviously described me to you."

"Point taken. But once I thought about it, I realized that it was stupid."

"Yes, but you thought about it since you had to deal with me. Now you're starting to see me for what I am. Maybe it's just my bad luck, but most men I ran into didn't hang around long enough to think about it. And in school I was a joke. I had to work twice as hard as everybody else to be accepted. I couldn't be an average kid with a social life. I had to be a brilliant one. Then I had an excuse to be different. But when I couldn't always be as good as the real top students, I started feeling bad about

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

myself. That's a hard habit to break. It also makes it easy to hold back from even trying to get close to anyone. It wasn't until my dad finally talked me out of computer science and into medicine, that I realized that that's what I was good at and wanted after all. I'd been fighting it because my parents were both doctors and they were pressuring me to follow them into the family practice. But once I started pre-med and went on, my grades went straight to the top and stayed there."

She laughed. "Of course then, when I felt better about myself, I was so busy I didn't have time to get out much. . . . But, enough about that. I didn't mean to rattle on."

She realized they were still standing by the door holding hands. She started to pull her hand free.

Bob resisted and brought her hand to his mouth briefly, to brush it with his lips before letting go. "Their loss. . . ." He blushed again. "I'm sorry, I didn't mean to—"

"Will you stop apologizing? It makes you sound insecure. Now, you didn't mean what? To kiss my hand? Or didn't mean to come on to me?"

Bob didn't answer for a moment, but looked around until he spotted a low bench by the opposite wall, between two other tall potted bushes. He went over to sit down, motioning her to join him. As she approached, he looked at her seriously from the same level. "I guess I *am* a bit insecure. Did it seem like I was coming on to you?"

She shook her head. "Not really, well, maybe a little. Not that I mind, mind you. *Are* you trying to come on to me? I don't mean that in a tacky way. Are you trying to get close to me? I get the feeling you are."

"Well, I really would like to get to know you better. You're a pretty impressive lady! I made some calls about you after I got back here and found out that you've got a hell of a rep. As a researcher, and a doctor. Your work on multiple sclerosis at Hopkins is textbook material. And your—"

She cocked her head and studied his face. "You're stalling. What are you worried about? By now I'm sure you've read up a bit on Turner's and you're probably not worried about my comment about," she smiled suggestively, "impaired sexual development—"

"No, that's not it! Hormone therapy takes care of that. . . . and, yes, I did read up a bit. But that's not it. I guess . . . part of it is that you're so petite and I'm—"

"And you're a big man. Relax." She hopped up on the high bench next to him and curled her legs under herself. "I'm not some little frail, delicate flower that you have to worry about. Mike, the second guy I was involved with, was about your size. We had a very nice, and pretty physical relationship going for several months until he decided he felt too embarrassed to be escorting me around and being mistaken for my father."

Bob still looked uncertain.

"What else?"

"I guess you had better chalk it up to being afraid to try. You see, I've been alone most of my life, too."

"Yeah? How do you mean?" Sitting next to him, it was the most natural thing to lean in just a little so her shoulder rested against his. Out of the corner of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

her eye, she saw him smiling down at her gently.

"First, because all through school I was a fat nerd with glasses. Honors straight through, but totally incompetent in any attempts to develop any relationship. Whenever I tried to ask a girl out—assuming I was able to get up the nerve—I was nicely refused. So I know a little about being alone. Which is strange, because I made friends with women easily enough. Probably more easily than with other men. But I was never able to try to take it further. That went on through med school, though as a prospective doctor, I was a little more acceptable. Even as a fat nerd."

Barbara twisted to look him up and down, and to survey him with a teasing smile. "Well, you don't look half-bad now. How long since you slimmed down?"

"Oh, a while now. About five years. But I've been so busy with work, and what I do is so esoteric that meeting women is still next to impossible. I'm still a nerd. A highly paid one, mind you. But the type of woman that seems to come on to me doesn't interest me—"

"You're hanging out in the wrong places."

"Probably. But until I met you, I had not been able to find a woman who does interest me—"

"How hard have you tried?"

"Lately, not very. It's a lot easier not to try, and then fool yourself into thinking that maybe she would have said yes if you had."

"So, are you trying, now?"

"Yes." He sounded almost defiant. "I know we just met but I've always been good at judging people. I don't have a lot of really close friends but those I do have, I connected with right away and they'll stand by me if I need help. I've yet to be wrong about a person's basic worth—"

"And what do your instincts tell you about me?"

"That you're as good a person as you are competent. You care. I saw your tears when you were telling me about that Turner's baby you found and knew you couldn't help. I already know about your abilities and accomplishments. Also, you're brave, if a bit stubborn. You came here in spite of the crowd outside." He shifted to nudge her with his shoulder. "And you have a good sense of humor. That's a lot of good things right up front. Sort of a predictor, if you will. It definitely makes you a lady I want to get to know better. I'll even risk saying it to your face."

He wore such a look of nervous expectancy that she felt compelled to lean closer. Suddenly she found herself kissing him. It seemed the most natural thing in the world. His arms crept around her and pulled her close, strong and comforting as they held her. Inside, a rational corner of her mind was protesting, but she ignored it.

Glass exploded around them, and the calm was shattered by a ringing alarm bell and a metallic crash.

A brick lay on the floor beside them and they looked out the shattered front door to see Gabriel approach, his face livid with anger. The harsh sun and angry voices that invaded the hall were a shock after the quiet half-light that had ruled it before the brick had interrupted their kiss.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"You're all devils!" the tall figure called out over the alarm bells as he stood in the doorway, half-hunched to look in. The doorway was blocked now by a metal grille that had snapped in place when the glass door had been shattered. But Gabriel carefully avoided touching any part of the grill, door, or building.

Barbara and Bob rose as one and Barbara saw anger matching her own come over Bob's face as he reached up to silence the alarm and approached the doorway. "Listen, you, I don't know what you think you're doing. You're sure as hell not going to stop us. But I'll tell you what will happen if you do: people will die! We're using technology to repair injuries, help crippled people walk again and thanks to Dr. Warner's research, we'll be using it to prevent birth defects. Where the bloody hell is the sin in that?"

"If God had—"

"If God had meant you to tell time, you wouldn't need a watch!" Barbara pointed to the gold digital watch strapped to Gabriel's wrist. "And your church used to have major holdings in print and electronic media, so you're obviously not against all technology." She stepped forward and grabbed the metal bars to glare out at him. "So, why is what we're doing against God's will? We're trying to ease pain and suffering and help our fellow persons. That's in line with even your church doctrine. We're not building weapons or trying to hurt people, so what's wrong?"

Barbara felt Bob's warmly reassuring presence behind her and reached back to grip his hand gratefully. "Bob, can you open the door, please?"

He nodded and reached up to key in another combination on the alarm panel. The metal grate slid silently up out of sight.

She stepped gingerly past the jagged spears of glass that still bordered the steel frame of the door. Bob followed her out onto the driveway.

Gabriel squinted as the sun caught her white linen dress brilliantly.

"Mr. Gabriel." Barbara moved closer to him. "I'm not putting down your faith. I believe in God, too." She nodded as he raised an eyebrow. "But I can't believe in a God who is so petty and cruel that He, She, or It would rather see unborn children born into crippled and twisted bodies, or good people die from damaged or sick bodies when we can prevent that by using the technology that our own, God-given, brains conceived of. What do *you* think?" She took a guess. "And don't answer in your father's words." She stepped closer and saw him retreat, eyes wide with surprise.

"What do you know about my father?"

"I know how your brother died. And how your dad probably brainwashed you so badly trying to defend himself that you have no choice but to stand here protesting." She pointed back over her shoulder. "With the resources in there, we can save lives and develop ways to keep children from being born with crippling, disfiguring, or embarrassing problems. Is that evil?"

Gabriel's fellow protesters were silent, looking to their leader for their cue. But Gabriel seemed confused by her challenge. He waved at his followers. "Back! I must deal with this evil crea-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

ture myself." They retreated and he turned back to her and settled to sit cross-legged on the dusty pavement with a heavy sigh.

She was shocked to see the fanatical expression melt away, leaving a weary look of pain on his face as he spoke quietly.

"Why do you bring up the past?"

"Then you are Victoria's husband?"

He nodded. "Who *are* you? One of her . . . doctors?" His face twisted briefly.

"No, but I've been studying your daughter. Why did you leave?"

"Vicky doesn't believe—"

"Is that why you left?"

"Yes. I will pray for both of them. God has charged me—"

"Personally?"

"Well, of course not. But I have to see that His will and that of the Church are carried out. Why do you think I carry on like a lunatic? People need charisma and dazzle to listen. Decades ago advertisers discovered that and were careful to sell the 'sizzle' instead of the steak. But the steak got sold, too. So, I carry the word in my own way—"

"By deserting your wife and unborn child?"

"I told you. I pray for them and if God sees fit, he will return them to me."

"Is this the same God who thinks it's OK to let our loved ones—innocent children especially—die or be born disfigured—"

"It is not for me to question God's word."

"I'm not asking you to. Only to think about how people might have misinterpreted what God wants done. And how to do it."

"Why?" Gabriel leaned forward intently and studied her face. "There's a reason that you're asking this. What's wrong?" Cold fear was suddenly clear on his face. "Please, tell me."

She moved close and touched his shoulder gently. "I'm sorry, but your daughter has the same condition I have. Without your help, she has little chance of surviving through to birth. We can't cure her or prevent her from having some of my problems, if she survives, but we can at least give her a better chance of being born healthy. Without your help, she has less than a 2 percent chance of being born at all."

He crumpled, sliding to one side, supported only by one arm. "How do you know?"

"I work at the hospital and I have been testing cell samples from all pregnant mothers seen there, including Victoria. I've been looking for a child with the same problem I have so I can try to develop a way of preventing it." She glanced back at Bob. "It, and other birth defects."

"You said 'daughter,' before. It's a girl, then?"

She nodded.

"Less than 2 percent . . ." He stopped, eyes haunted. Then he spoke mechanically. "If she is meant to d-d-die, then it is God's—"

"That's your father talking!" Barbara grabbed him by the shoulders and shook him. "Do you think your daughter deserves to die? Do you really think God would rather see an innocent, unborn child die when there's a way to save her? This is a child you and your wife want and love, not an embarrassing accident who might be neglected and

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

abandoned if born. Even though you're separated, that's obvious."

With a tender ease that revealed that his strength was carefully kept in check, Gabriel freed himself and rose, towering over her again. "Please . . . Doctor, you must give me some time to think about this. I am a man of faith, and I can't just ignore what I've lived with my whole life. Do you understand?" His face was a mask of uncertainty and pain.

"I guess so, but this—"

"Please! I know there is probably much more you want to say, but not now. I need to think."

She looked at him, seeing moisture forming in his eyes. She nodded. "Of course." She reached into her belt-purse and pulled out one of her cards and handed it over to him. "Here's my card. When you're ready, put it in any Reader and it will give you my complete bio and references. You'll see that I'm serious in my concern for helping people. Then use the card to call my office, or just come in and I'll explain the truth about what we are doing. And what the problem with your daughter is. If she makes it to birth, it's really not that bad. It's just insensitive people who make it hard sometimes. And if you'll give us permission to help, we'll be able to give her a much better chance of surviving. That much we can do for her, I think. We should be able to learn enough that we can help make sure she lives. And you'll be helping countless other children." She reached up to touch his arm gently. "I am sorry I can't promise more. But in the meantime, go home and think. And call your wife, please. You need to talk to her. I'd like to see you both at the same time when I go over your daughter's problems."

"Thank you . . . Doctor—"

"Barbara."

"Thank you, Barbara." He turned to Bob. "I'm sorry about the brick. Some hothead in the back threw it. Now please, go back inside."

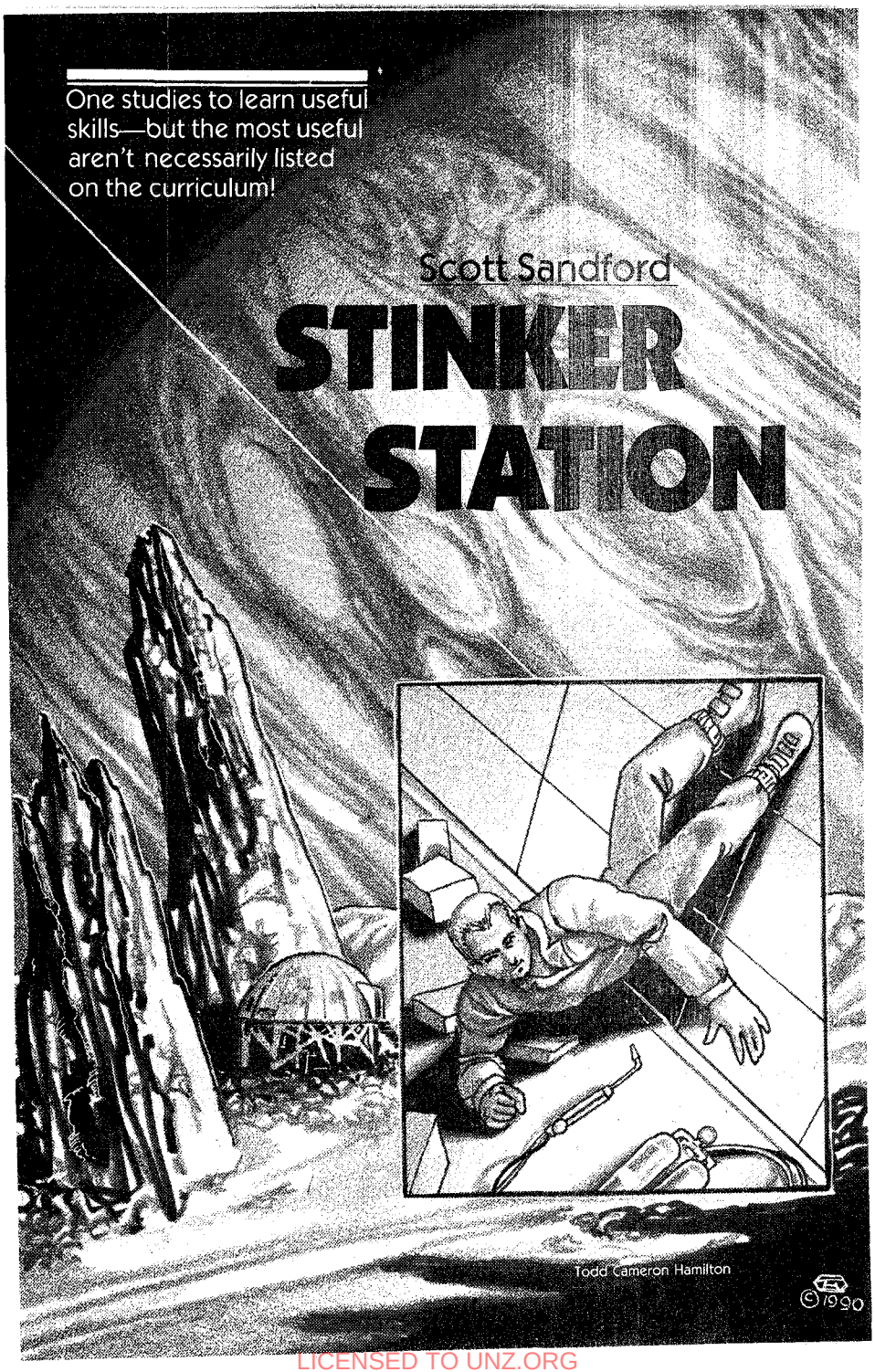
She wanted to say something, but Bob's hand on her shoulder stopped her as he eased her back towards the building to leave Gabriel standing there alone to face his confused followers.

Barbara grabbed Bob's hand and together they reentered the cool hallway of NanoSolutions. ■

●Only the unexpected can bring good fortune, but it must come up against much of the expected and disperse it.

Elias Canetti

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED


One studies to learn useful skills—but the most useful aren't necessarily listed on the curriculum!
Scott Sandford
STINKER STATION
Todd Cameron Hamilton
©1990

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

As always, Gene took a moment after leaving to simply stand and stare at Jupiter. Local day was beginning for the station, so Jupiter hung overhead, half illuminated. The Sun was a bright star above the horizon. Somewhere below the horizon in the opposite direction, a volcano was erupting. From the width and height of the plume Gene guessed that it was somewhere in the Cataquil Patera complex. The shape of the plume that rose over the horizon reminded him of one of the lawn sprinklers they'd had when he was a kid. In the airlessness of Io the ejecta in the plume followed ballistic curves that climbed gracefully into the sky and then returned kilometers from the vent. The small grains in the plume back-scattered sunlight very efficiently, and against the jet black backdrop of space the plume had a beautiful luminescent quality.

Even after having seen it hundreds of times, it still seemed too big, too grand to be real. The view always made him feel like he was in some movie studio and that at any moment someone would turn on the lights and break the set. He had been standing entranced for several minutes when a brief, sharp tremor rocked the ground beneath him, reminding him why he had come out in the first place. Volcanos cause quakes. Quakes cause damage. And on Io, survival requires that the damage be repaired quickly.

Gene twisted his head to activate his radio. "Hey, Tomo. You there? I'm clear of the station."

"I hear you fine, Gene. What's the plan?" the headphones in his suit crackled.

"I'll be going to fix those shelves in the Shack. I ought to be dropping out of line-of-sight communication in a few minutes."

"Okeydokey. How long before we should get worried?"

"I figure it should take about two hours, so it'll probably take three. Why don't you worry in four?"

"All right, let's see . . . there we go. It's in the logbook now. Seventeen hundred hours—commence worrying. Anything else?"

"Nope, see you for dinner."

"Speaking of dinner. Why don't you bring back some takeout?"

"Right," Gene snorted, "but whatever I bring in, you have to eat."

"Look, if it doesn't smell like rotten eggs, I will!"

"You're on. Well, I owe, Io, it's off to work I go! Out."

Gene picked up the toolbox resting at his feet, grabbed the handle to the welding cart, and began the several hundred meter trip to the shack. Despite the relatively low surface gravity of Io (about 18 percent of Earth's) and his already cold feet, Gene was sweating within moments. The low gravity did not entirely compensate for the bulkiness of all his gear, the uneven terrain, and the ever present staleness of his bottled air.

The main station and the Shack were separated by a rough expanse of yellowish, frosted ground. Most of the frost consisted of sulfur dioxide, or SO_2, but there were also traces of hydrogen sulfide, H_2S, and good old H_2O. As Gene reminded himself daily, SO_2 and H_2S are toxic. Even at concentrations as low

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

as a few parts per million SO_2 causes intense eye and throat irritation. Larger amounts result in severe coughing and constriction of the chest. At room temperature, and in the presence of water, it can also react to form sulfuric acid. H_2S is more deadly still, more poisonous than cyanide. At concentrations of parts per million it irritates eyes and causes headaches, dizziness, confusion, and a host of respiratory problems. Large exposures can lead to pulmonary edema and respiratory paralysis. And just to add insult to injury, H_2S has the characteristic, unpleasant aroma of rotten eggs.

No, Gene thought to himself, Io would never be considered a good holiday spot. On Io volcanos spit sulfur compounds 300 km into space, where they froze, and rained down on a surface whose average temperature varied between about -170 and -150°C, a little over 100 degrees above absolute zero. To top it all off, Io was constantly blasted by radiation associated with Jupiter and its large magnetic field.

Of course, none of this decreased the scientific interest in Io one bit. If anything, it fueled it. Io remained one of the few objects in the Solar System, along with the Earth and Neptune's satellite Triton, that were known to still be undergoing active geological processing. Thus, it was only natural that when man finally got to Jupiter much of his curiosity and scientific effort would be aimed at Io.

Gene represented the culmination, the focal point, of this interest. As a young boy, he had developed a passion for Io the moment he set eyes on a picture of the satellite in a glossy astronomy book he had found in the public library of his home town. He had vowed to himself that someday he would go to Io and stand on its surface. While the boyish naïvete of that vow had left him over the years, his hope and desire had not. When the Jupiter-manned mission was announced as an official UN space project Gene had been ready. He had organized his schooling and work experience with one thought in mind—to be on the Jupiter mission crew and to be a part of the Io landing team. Now he was there.

And the whole thing stank. Not figuratively. Literally. Gene's training had not prepared him for the experience of living with the constant, unrelenting smell of rotten eggs. As he trudged across the Io landscape he could see the boots of his pressure suit sending up puffs of gas. The boots of the suit were as well insulated as the technology of the day could make them, but that was not good enough. With each step his boots warmed a thin layer of SO_2 frost above the 130 K temperature required to vaporize it in a vacuum. The vaporizing SO_2 released its trace cargo of H_2O and H_2S. All these molecules then sought out cooler places to recondense, including Gene's toolbox and welding gear. No matter how careful you were, some of this material got into the station with you. Since the human nose has no trouble detecting H_2S when its concentration in air is only parts per million, the station stank. There wasn't anything anyone could do about it. And as if to add injury to insult, some of the residual SO_2 that entered the station reacted with the water vapor from the humidifier to form sulfuric acid. The result was irri-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tated noses, eyes, and lungs, and a more or less constant sore throat.

Still, all things considered—stink, sweat, and sore throat—there was no place in the Solar System that Gene would rather be. There were other things, however, that Gene would rather have been doing. As on any scientific expedition to a remote location, each of the members of the party had to frequently leave their scientific duties and spend time on various maintenance chores. Most of the work was boring, tedious, and absolutely vital for their survival. Gene's chore for the day was likely to meet the first two criteria, but he wasn't so sure it met the last one. In any event, it was a chore made necessary by the station's location.

The location of the base had been chosen as a compromise between the scientific interest in getting close to some of Io's volcanos, the scientists' personal interest in staying alive, and ultimately, the UN bureaucracy's interest in the safe keeping of several billion dollars worth of equipment. The result was a station near –25° latitude and 5° longitude. The location was surrounded by volcanic complexes, but none were closer than about 150 km. At those distances the base was relatively safe from large pieces of ballistically launched ejecta, although it did occasionally get coated with frosts from gas plumes. It was also close enough to allow for the operation of robotic vehicles in the outer regions of the various volcanic complexes. The inner, hotter areas of the volcanos were studied using expendable rocket-driven probes launched from the station.

When the party had first set down on Io they had immediately constructed a small airtight building from prefabricated sections. This building, which quickly became known simply as "The Shack," had been used as a temporary shelter while the party constructed a more permanent station. Everyone had moved into the permanent station upon its completion and the shack had been converted into a general storage area. The move to the new building was promptly followed by a short and rather silly ceremony in which the base was formally christened "Stinker Station." The five residents had then quickly settled in and begun to set up their various scientific instruments. The shack had then been largely forgotten.

While the station was in no real danger of being inundated during the eruptions of nearby volcanos, it was close enough to feel the effects of associated ground tremors. Gene referred to them as "Ioquakes" ("earthquake" just didn't seem to apply). Stinker Station was periodically shaken by mild tremors that could last up to a few minutes, although the average was much shorter. The main building had been built with care and there had never been any indication that the tremors constituted a major threat. Everyone had quickly adjusted to the need to take simple precautions to insure things didn't fall over during a shake and that was about all that was deemed necessary. Having experienced, as a kid, the Loma Prieta Quake in '89, Gene didn't find the Ioquakes to be particularly frightening or violent. After a tremor he would generally pause briefly to listen for the air pressure alarm. If the person on duty in the control room didn't find any evidence of an air leak,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the All Safe horn would be sounded and everyone would go back to work. Gene had quickly reached the point where he often didn't even consciously notice the smaller tremors.

The Shack, however, was a problem. It had been put up in a hurry to provide immediate shelter after arrival of the landing team. Once the main building had been completed and occupied, everyone had better things to do than to go back and tidy up the old building. After the various scientific programs were started and running smoothly there had been some discussion about fixing the place up. It did, after all, represent their only refuge if something should happen to the main building. The talk turned to action when Lewis had gone to the shack to pick up some bolts and found that the latest set of tremors had tipped over some of the shelves in the back rooms. A number of Gene's ion gauges had been smashed and he had stated in his best stentorian public speaking voice that "Something Had To Be Done." This, Gene had quickly found out, was a mistake. The other four had applauded and voted that, since he was personally so enthusiastic, he had the job.

The relatively thin-walled shack had been placed in a small natural depression in order to provide some additional shielding from radiation. As a result, it was not visible from the main station and was out of direct line-of-sight communication. As usual, Gene had to suppress a laugh as he came within sight of the shack. It consisted of a small hemispherical dome about ten meters across that was held suspended a meter above the ground by stilts. The stilts minimized the Shack's contact with the ground and simplified the task of keeping its interior warm. The gradual accumulation of various sulfur compounds on the shack's original coat of green paint had given the building a rather sickly yellowish cast. The overall effect always made Gene think of a large, jaundiced ladybug.

He silently saluted the building with a variation of an old nursery rhyme. "Ladybug, ladybug, fly away home, your house is on fire, and . . ." Hmmm. For some reason the end of the rhyme temporarily escaped him. "Oh well," he muttered to himself, "the house is at least four AU away. It'll be ashes long before you could get there anyway."

The whine of his suit's heaters and the cold gradually creeping into his feet reminded him he had better be on his way. Besides, he wasn't doing himself any favors in terms of radiation exposure. He descended to the Shack and carefully hoisted the welding rig and the toolbox onto the elevated "porch" in front of the outer airlock door. He then climbed the short ladder to the landing and opened the outer door. It was a tight fit to get both himself and the gear in the airlock at the same time. Once the outer door was closed and checked for a proper seal, he flooded the airlock with dry air and opened the interior door. After a brief struggle Gene had all the gear out of the airlock and into the Shack's main room.

The inner door closed and sealed, Gene began the laborious task of removing his pressure suit. This was hung on a special rack near the inner airlock door. Next to the rack were the airlock

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

controls and the "scram" switch that sounded an alarm in the main building. He placed the helmet on a nearby shelf and then began dragging his gear into one of the small cubicles at the back of the common room. These small, closet-sized rooms had originally served as rooms for the individual landing party members. After the move to the new building the rooms had been filled with shelves and converted to storage.

Gene made a quick survey of the room. As a safety measure, the door had been designed to seal airtight in order to aid in the control of potential pressure leaks. On the wall adjacent to the door were pinned several safety notices and lists of the contents of the room. One page contained a rough sketch of Smokey the Bear pointing at the reader and sported the admonishment "Remember, Only You Can Prevent Forest Fires." The back and side walls were completely filled by sets of shelves that extended from the floor to the ceiling. The shelves were loaded down with a variety of boxes, bags, and loose equipment.

It was the shelves that were the problem. It was Gene's job to weld them securely to the wall so that they wouldn't tip over during any future quakes. It only took him a few moments to set up the welding rig. Its design was based on the standard acetylene and oxygen rig you might find anywhere on Earth, although there were several modifications to insure it worked properly in a near vacuum as well as in normal air. He began to whistle in a rather tuneless way as he concentrated on the job. Soon he had the torch lit and the gas mix adjusted to his satisfaction. He began to work.

He had just completed the rack of shelves along the back wall when the tremor struck. Gene first felt the compressional P-wave. It did not feel like a particularly severe one but Gene instinctively snapped off the torch. The slower shearing S-wave hit several seconds later. The tremor rocked the shack with a muffled bang followed by faint creaking as the building swayed on its stilts. As he had predicted, the shaking was not unduly violent, although he felt uneasy about the peculiar additional twisting motion he felt beneath his feet. He noticed a faint groaning sound coming from below the floor. Within moments the sound grew to a crescendo of squeals and groans. The building collapsed.

The next few seconds contained so much activity that Gene was not fully able to comprehend what happened. The shack did not fall off its stilt supports evenly but instead collapsed at one end first. The resulting tip sent Gene against a set of shelves while boxes of bolts rained down on top of him. He had just about recovered to his feet when the remaining stilts collapsed and the entire procedure was repeated against the opposite set of shelves. This time, however, there was a difference. The final collapse was accompanied by an explosive bang as the air seal in the common room ruptured. Gene's ears popped and the air in his lungs escaped with a belly-felt lurch. The room briefly filled with a thick mist as the water vapor in the air condensed. He was dimly aware of a second, fainter bang followed by an unexpected silence.

Gene groggily swayed to his feet. He was having trouble thinking but he was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

sure there was something he should do. And urgently! He staggered drunkenly towards the door. His feet got tangled in the hoses from the welding rig and he fell. A few feeble kicks failed to remove the offending hoses so he sat up to untangle them. The bottles! Gene reached over and opened the tank valves with a savage twist. The room began to fill with oxygen and acetylene. Air! He clumsily freed his feet from the tangle of hoses and stood up. His head was clearing a bit but he was starting to feel a bit sick. Suddenly it occurred to him why and he snatched up the torch and turned off the flow of acetylene. When his ears had popped several more times he also shut off the flow of oxygen.

He gave out a weak croak. It was hard to tell because of the ringing in his ears, but the volume and tone of the sound suggested that the air pressure was no longer dangerously low. Apparently the air-seal rupture had not extended to this room. The rapid flow of air out of the room had pulled the air tight door shut and saved him. Gene voiced a brief prayer of thanks that none of the debris from the shelves had gotten in the way of the door.

A quick inspection of the door showed no obvious leaks. He thought he could hear a faint whistling along one of the seams but the ringing in his ears made it difficult to be sure. Perhaps the collapse had warped the frame slightly. Gene briefly considered covering the seam with a weld, then changed his mind when he remembered all the acetylene in the room. A few moments of rummaging through the toolbox turned up a small tube of glue which he smeared liberally around the offending area. It might have been his imagination, but he thought the whistling quieted.

The immediate danger over, he stopped to take a few deep, calming breaths. This sent him into a brief but violent coughing fit. Once recovered, he started to take careful stock of his situation. The cubicle he was in was temporarily safe. His supply of oxygen, however, consisted solely of the small pony bottle on the welding rig. It couldn't last for more than an hour, maybe two. He couldn't count on Tomo being officially worried for another three hours. Tomo might feel that the quake justified sending someone out to check on him, but he couldn't count on it. After all, the tremor itself had not been unusually strong. Why would they worry, Gene thought, we've been through hundreds like this. It's up to me to let them know I'm in trouble.

The situation outside his cubicle looked grim. Peering through the small porthole in the door he could see out into what remained of the common room. It appeared to have been severely twisted down the middle. A large crack could be seen running the length of the floor. The ceiling was also twisted, although its damage seemed to be limited to several small holes. The floor was the worst part. When the shack had fallen, its floor had come into direct contact with the ground. The building was beginning to cool rapidly. The heaters in the floor were attempting to compensate for the extra load and were running at maximum capacity. The majority of this heat was going straight into the ground and vaporizing the underlying frost. The resulting SO_2 and H_2S gases were boiling

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

through the crack in the floor. These gases briefly swirled about the room before escaping through the holes in the roof.

Gene's pressure suit was clearly visible on the other side of the room. It might as well have been a thousand miles away. If he broke the seal on the door he'd only have a few seconds of useful consciousness. There was no way he would have time to cross the room and get the suit on before he passed out. Even if he made it he'd still have problems. What good is a pressure suit if it's filled with toxic gases when you get into it? No, he decided, opening the door was out.

This line of thought reminded him that it was time to let a little more gas out of the oxygen bottle. He disconnected the gas bottles from the welding rig and set the acetylene aside. The hiss of gas escaping from the oxygen bottle sounded woefully inadequate to the task of keeping him alive. Think, damn it, think!

What about the scram switch by the door? If he could close the circuit it would sound an alarm in the main building, assuming, of course, that the collapse of the shack hadn't severed the line between the buildings. Again, he couldn't break the seal on the door. He might be able to dash across the room, hit the switch, and dash back before losing consciousness, but then what? He'd have to reseal the room, which would have filled with poisonous SO_2 and H_2S, and then expend the rest of the oxygen bottle in an attempt to pressurize the room. He was not sure his oxygen bottle was large enough for the demands this plan would make of it. After a moment's thought he realized that, in any event, his courage was not up to the task. Maybe when I'm a little more desperate, he thought.

Perhaps there was a way he could set off the scram switch without opening the door. Could he hit the switch with something? He couldn't open the door, but maybe he could drill a small hole and . . .

Almost frantically Gene grabbed the welding torch. He then dumped out the toolbox and scrambled through the resulting pile until he found a hacksaw. Bracing the torch on one of the shelves, he quickly removed its tapered tip. The end of the torch was now a 20-cm long straight tube. Some additional scrambling around on the floor yielded a thin bolt that just fit down the barrel of the torch. He then reattached the torch to the acetylene bottle and dropped the bolt down the bore of the torch. He adjusted the regulator for maximum pressure, pointed the torch at one of the boxes on the floor, and cracked the valve. The bolt hit the box with a very satisfying crack before ricocheting back behind the shelves. Gene checked the pressure reading on the bottle. The high pressure setting had greatly depleted the bottle. It was clear that he only had enough gas for a few shots.

OK, he told himself, now for step two. After a few moments of searching he found a small piece of rigid plastic. He then dug his cordless power drill out of the pile of tools and selected a drill bit that was slightly larger than the torch's diameter. Carefully he began to drill a hole in the door just below the window. When he heard the first faint whistle of air escaping through the hole

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

he avoided the panicked temptation to withdraw the drill immediately and slap the plastic over the hole. Instead he kept at it until he had a clean hole all the way through the door. He then quickly withdrew the drill bit and put the plastic in place. The air escaping through the hole sucked the plastic firmly to the door. The seal was not perfect but the air loss was not too bad. As a precaution, Gene released some more gas from the oxygen bottle.

A careful examination of the scram switch through the porthole window revealed a potential problem. The switch was covered by a hinged plastic plate that had to be swung up before the switch was exposed, preventing anyone from accidentally setting the alarm off. "Excellent," Gene muttered to himself, "I'm glad we thought this all out beforehand." He could see no other option but to try to shoot straight at the switch. Perhaps a good solid hit by a bolt would knock the cover off, or maybe shatter it. Gene placed a second bolt in his jury-rigged air gun and stood at the door. He rehearsed in his mind what he was going to do. When he was satisfied he had it worked out, he took a deep breath and started.

Turn tank regulator pressure up, remove plastic plate, stick the tube through the hole, ignore the scream of lost air, aim carefully. . . . Fire! Now, quickly get the plastic plate back in place!

He had missed. The bolt had struck about ten centimeters to the left of his intended target. A check of the acetylene bottle showed he had enough pressure for two, maybe three more shots. He paused to let some more gas out of the oxygen bottle and to try to stop the shaking of his hands. A few deep breaths and he was ready to try again.

Turn tank regulator pressure up, remove plastic plate, don't drop it! Stick the tube through the hole, the scream of lost air, aim, aim . . . Fire! Now, the plastic. Quick!

A hit! Gene whooped with glee. His elation proved to be short-lived, however. He had clearly hit the plastic cover dead center, but other than a small star-shaped crack there had been no effect.

"Damn government issue!" he howled as he pounded the porthole with his fist. "The stuff breaks at the drop of a hat until you want it to!"

This isn't going to work, Gene thought, that stupid plastic cover is going to kill me. It was going to keep him from closing one dumb little circuit and he was going to die. Gene slumped to the floor and put his head in his hands. Gotta close one stupid circuit, he thought. One stupid circuit. One lousy, stinking . . . Oh. *Oh!*

Gene scrambled back to his feet and looked out the porthole again. The switch no longer claimed his attention. What interested him now was the insulated cable that came out of the switch box. It ran along the wall for a short distance before disappearing into a conduit. The cable contained two insulated wires that were neatly braided together. All the switch did was put the ends of the two wires in contact. Maybe, he thought, I can do that without the switch.

He briefly considered firing a bolt directly at the cable. Perhaps the bolt would break the insulation and short the circuit. It was risky though. It was more likely that he'd miss the cable entirely.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Worse yet, he could sever it. He decided that he'd try it if he couldn't think of anything better in the next few minutes. In order to defer an immediate decision he picked up the oxygen bottle and let out another blast of gas. Getting low, he noted before returning to the porthole.

He returned to gaze out the porthole at the cable. The SO_2 continued to boil up through the crack in the floor. Just looking at all that stinking gas sent him into a brief but heartfelt coughing fit. And then it suddenly came to him. He didn't need to worry about shooting another bolt. The idea seemed so simple and silly that he doubted he was thinking clearly. He returned to the oxygen bottle and let it spray straight into his face for a moment. The idea didn't go away. "All right," he said to himself, "why not?"

Deliberately, he stepped to the side of the door and tore the small poster of Smokey the Bear off the wall. He carefully tore it into thin strips and then tore the strips into confetti-sized pieces. He looked at the mound of paper in his hand, laughed, and stuffed them in his mouth. He noticed in a rather abstract way that his hands were still shaking.

The coffee was too hot. It burned all the way down. And Gene couldn't have been happier about it. He wasn't being given much of a chance to enjoy it, however.

"Come on, don't leave us in suspense," Julian pleaded. "How did you get the alarm to ring?"

Gene looked up at the circle of expectant faces before him and smiled. Their mixed expressions of concern, joy, and impatience were the nicest things he could ever remember seeing.

"Well," he began, "it finally sank in that all I needed to do was get the insulation off the cable so the wires could make contact and trip the alarm. It was about then that I had a coughing fit. I can remember thinking about what all that SO_2 and H_2S in the common room would do to my throat. It would do the same thing to my throat that I wanted to do to the wire insulation! I realized that if I could get some good ole H_2O on the cable, it would react with the warm SO_2 gas coming up through the floor to produce sulfuric acid. The sulfuric acid would then do the work for me!"

Gene leaned back in his chair so as to better appreciate their undivided attention. He let them wait for a moment.

"And?" snapped Tomo.

Gene looked at Tomo's impatient glare. OK, he thought, maybe I'd better not go with the dramatic pause after all.

"Well, I proceeded to get some water on the cable. I did it by chewing up a piece of paper and making the biggest spit wad you have ever seen in your life. I loaded the whole mess into my glorified pea shooter and I fired it across the room through the hole in the door. It made a very satisfying splat that soaked a fair portion of the cable. Not too long afterwards I was gratified to see you folks hustling to the rescue."

The four faces in front of him oscillated between disbelief and something Gene couldn't immediately identify. When it was clear none of them knew what to say, Gene continued thoughtfully.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"You know, I can remember spending what seemed to be an infinite number of hours in Ms. McClellan's seventh-grade English class. I used to find the class horrendously tedious and I would amuse myself with pranks. Up until today I would have sworn I never learned a single thing of importance in that class. Now I know better."

And they would have had a good laugh over that if their throats hadn't been so sore. ■

IN TIMES TO COME

● Our next issue is the July Special Issue, with nearly twice the usual quantity of contents, including several items of exceptional quality and interest. The one with the cover is something readers have been asking for: Part one of Lois McMaster Bujold's new four-part serial *Barrayar.* Lois's tales of Miles Vorkosigan have consistently turned up as favorites in our reader polls and general correspondence, and several readers have written in to suggest that there must be quite a story in the events leading up to Miles's troubled birth. Yes, there is, and this is it. I think you'll agree, whether or not you've already read any of the other stories in this series.

The fact article is something special, too. If you remember his March 1990 article on NIMFs, or if you follow space publications like *Ad Astra,* you may already know Robert M. Zubrin as a veritable fountain of innovative ideas for getting humans out into the Solar System. He's back next month, this time with co-author David A. Baker, with "Mars Direct," a detailed plan for establishing a viable colony on Mars—soon.

And, of course, we'll have an extra-large helping of other fiction, with notable stories by such folk as Dean McLaughlin, Daniel Hatch, Amy Bechtel, Rob Chilson and William F. Wu, Don Sakers, and Jayge Carr.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

The Alternate View

RHIC: BIG BANGS IN THE LAB

John G. Cramer

© 1991 by John G. Cramer

Imagine that we are watching the flight of a nucleus of a heavy element, say a gold nucleus with 79 protons and 118 neutrons. It has been accelerated until it is traveling with a speed of 99.9957% of the velocity of light. A nucleus at this near-light speed will show two striking relativistic effects: (1) its mass will increase and (2) its length will shrink in the direction of travel. At 0.999957 **c** the mass-energy of the nucleus will increase to 108 times its rest mass (or 100 GeV/nucleon, for those who know the lingo). At the same time, its thickness in the direction of travel will shrink to 1/108 of its thickness at rest. The nucleus will resemble a pancake with a thickness about 1% of its diameter and a mass that has been increased by a factor of 108.

Now imagine that this accelerated gold nucleus has a head-on collision with a second nuclear pancake, a gold nucleus accelerated to the same ultra-relativistic velocity but in the opposite direction. Momentarily, the two pancakes in this light-speed head-on-collision will overlap. The masses of the nuclei have been *increased* by a factor of 108, and the mass of each is contained in a volume that has been *reduced* by a factor of 108. As a result, neglecting the fuzzing effects of the Heisenberg uncertainty principle, the instantaneous density of mass-energy in the overlapping collision volume is 2 x 108^2 or 23,328 times the density of a normal gold nucleus at rest.

There are 197 nucleons (neutrons and protons) in each gold nucleus. Any line cut through the center of the nucleus will intersect a stack of about 7 nucleons. Therefore, the collision of the two nuclear pancakes will involve linear stacks of nucleons impacting again and again with the "wreckage" of collisions of nucleons just ahead in the stack, a seven-fold repeated "chain reaction" pileup reminiscent of a California freeway.

The standard theory of quantum chromodynamics describes nucleons as composed of three *quarks* held together by *gluons*, the mediating particles of the color force, also called the strong interaction. A gluon that is binding two quarks can be visualized as a color flux tube or *color string* connecting one quark to the other. In the collision described above the color strings are repeatedly broken, snarled, and tangled, producing what has been described as *color spaghetti*.

The brief transient phase of ultra-high mass-energy density is followed by a longer-duration phase in which the two now banged-up projectiles, still carrying very high energy and momentum, pull apart. The tangled color strings pull hard on the quarks as the projectiles separate, extracting a fraction of the huge collision energy and leaving a wake of energetic debris in the path of the separating nuclear projectiles. This wake

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Illustration © 1991 by William R. Warren, Jr.

is predicted to be almost free of identifiable nucleons and to contain 10 to 100 times the mass-energy density of a nucleus at rest. It is called a *quark-gluon plasma*, a completely new state of matter that has never been studied by physicists, that perhaps has not *existed* in our universe since the first few microseconds of the Big Bang, the time at which the cosmos cooled from a plasma of quarks and gluons to a "soup" of nucleons and mesons.

The quark-gluon plasma thus represents a new and unexplored territory in the domain of nuclear physics. Exploring this quark-matter territory may simply provide a confirmation of our present ideas about matter under extreme conditions, but it may also reveal a new landscape dotted with strange and unanticipated wonders.

This Alternate View column is about a new initiative in nuclear physics that will produce a new accelerator facility to permit the study of this new state of matter. The facility is the Relativistic Heavy Ion Collider (RHIC), a $397 million accelerator facility to be built over a period of six years at Brookhaven National Laboratory with funds from the US Department of Energy for the study of ultra-relativistic heavy ion collisions. I rarely write about my own scientific work in these columns, but this one is an exception. In June of 1990 I joined a collaboration that is proposing to build a $27 million detector to be used at RHIC in about 1997, after that facility goes into operation. I plan to do physics at RHIC.

So I want to tell you about the facility. First, I will recount the somewhat dis-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mal events that preceded the RHIC project. In the early 1980s Brookhaven National Laboratory was in deep trouble arising from the lagging construction of a new particle accelerator called ISABELLE, a 200 GeV on 200 GeV proton-proton collider. The source of the trouble was that the project had been started too soon. In 1977 the powerful congressional delegation of New York state had overpowered the congressional funding committees and inserted the funding for ISABELLE into the Department of Energy (DOE) budget, placing it ahead of competing high energy physics projects and a full year ahead of the schedule the DOE and its advisory committees had made for funding the project.

Pushing the ISABELLE schedule ahead by a year was, as it turns out, a disastrous blunder. The superconducting magnets that were to be the heart of the machine had worked well in prototype tests, but not enough testing had been done. When the production models of the magnets began to come off the assembly lines, they could not be made to work at the magnetic field levels needed for the machine. The missing year of prototype testing, short circuited by political clout, had resulted in an unworkable magnet design.

The magnet design problems were eventually fixed, but only after it was too late. In 1983 a physics advisory panel recommended that the ISABELLE project be scrapped so that more effort could be focused on the design of the new Superconducting Supercollider project. George A. Keyworth, President Reagan's science advisor, announced shortly afterwards that ISABELLE had been cancelled. As someone put it, ISABELLE had become WASABELLE.

The old ISABELLE accelerator vault had been preserved at Brookhaven, along with all the cryogenics, staging areas, and the support facilities that would have been used by the cancelled superconducting accelerator. RHIC, the new accelerator, will be built in the tunnel and will use all the liquid helium refrigeration and other equipment installed almost a decade earlier. RHIC will rise from the ashes of ISABELLE, and as a result will be a factor of 2 cheaper than if it were constructed elsewhere. The startup funding for RHIC is in the new fiscal year 1991 DOE budget that finally passed the US Congress last September after the big budget logjam was broken. Accelerator physicists and engineers at Brookhaven are swinging into action to produce the machine, which should begin initial beam tests in about five years.

RHIC will use not only the ISABELLE equipment, but also will take advantage of the accelerator complex that already exists at Brookhaven. The RHIC beam of particles will start at one of two existing MP Tandem Van de Graaff accelerators, then be routed some distance uphill to an accumulator/booster ring accelerator and into the Alternating Gradient Synchrotron, a 1960s accelerator that was once the premier facility of high energy physics and is still in operation. Heavy ions from the AGS will be sent in both clockwise and counterclockwise paths along the RHIC ring, and both beams will be accumulated to the desired intensity and then ramped up in energy to the full design energy of the machine.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

At six regions around the RHIC ring the two beams traveling in opposite directions will be squeezed together and caused to intersect and collide. At four of these intersection points, experimental physicists (including my collaboration, we hope) will construct detectors to study the collisions and try to understand the new state of quark matter produced. The RHIC beams recirculate through the ring, passing through the intersection regions over and over until, after some hours or days the two beams have dropped to an unacceptably low level. They are then dumped, and the RHIC accelerator ring is reloaded with fresh beams of heavy ions.

Here are some questions and answers about this new accelerator facility.

Q: Why build *two* expensive accelerators, RHIC and the Superconducting Supercollider?

A: RHIC and the SSC are both colliders, but they are very different machines in cost as well as purpose. RHIC is much cheaper. The entire RHIC accelerator facility costs about as much as a single SSC detector. Moving upward, the SSC total cost is about equal to the *increase* last year in the estimated cost of NASA's Space Station Freedom. And S.S. Freedom, at worst, will cost as much as a month or so of Operation Desert Shield. And so on.

Q: But why can't the RHIC physics be done at the SSC?

A: The SSC is designed primarily to discover the Higgs boson and the top quark, if the latter has not been found by the time the SSC comes into operation round the year 2000. It will operate at energies a factor of 100 higher than RHIC, but in its initial configuration will accelerate proton beams exclusively. No heavy ion injection system for beams of heavy nuclei are planned for the SSC. Its beam stations will be used exclusively for experiments in its higher energy domain. The SSC has much higher collision energies, but only a few quarks localized in a small volume are involved in its collisions. No significant formation of a quark-gluon plasma from SSC proton collisions is expected.

Q: What happens if a quark-gluon plasma is formed?

A: The quark-gluon plasma has only a brief lifetime, at the end of which its energy goes into particle production. It has been calculated that a single RHIC collision event might produce 4,900 charged π-mesons, 500 charged K-mesons, 300 neutrons, 300 protons, 130 antiprotons, and a few thousand gamma rays, and a few hundred other miscellaneous particles. The task of investigating the collision event therefore becomes one of measuring some fraction of these particles and drawing conclusions from these measurements.

Q: What will the RHIC detectors do?

A: There are two basic detector strategies. One is to select some specific signature of the quark-gluon plasma and to design a detector that focuses almost exclusively on that signature. Most of the detectors proposed for RHIC are based on that strategy. The alternative strategy is to track as many of the particles from the collision as possible. The detector design in which I am participating is one of two designs proposed using the second strategy and involves construction of a *time-projection chamber*, a modern electronic equivalent of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the cloud chambers that were used in nuclear physics in the 1930s.

Let me finish by saying why I decided, a few months ago, to get involved with this kind of physics, which is on a far larger scale than the experiments I have done in the past. The Hanbury-Brown-Twiss (HBT) effect is a quantum optics trick used by astronomers to measure the sizes of nearby stars. If light from a nearby star is detected simultaneously in two telescopes and the detector signals are multiplied, the combined signal shows an interference pattern characteristic of the diameter of the star.

It happens that the HBT technique also can be used with the π-mesons produced in a RHIC collision, a brilliant "flash bulb" of particles casting bright illumination on the event. These particles, through the HBT effect, can be used to reconstruct the size, shape, and eccentricity of the source that emitted them, which might be a cooling quark-gluon plasma.

Thus in this new domain of energy density, where new physical phenomena may be lurking, there is the opportunity to study individual collisions, not in some statistical average but as single collisions. If there is a hint of new physics, the events, without any pre-judgment about signatures, can be studied in excruciating detail.

It is said that if you would see what none has seen before, you must look where none has looked before. It is my hope that RHIC will allow me and my colleagues to do just that. ■

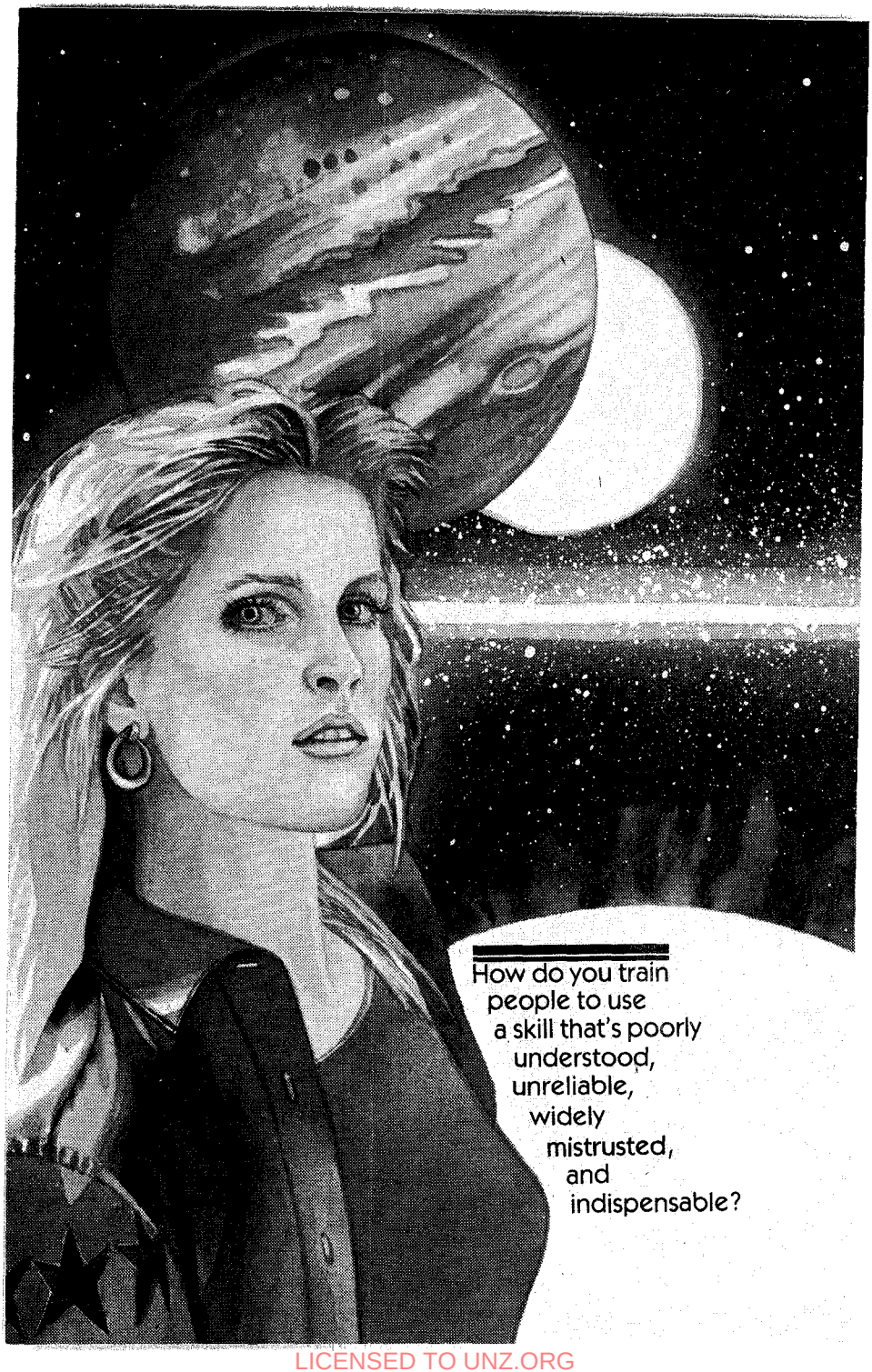
REFERENCES

Quark-Gluon Plasma:
Larry McLerran, *Reviews of Modern Physics* 58, 1021 (1986).
Hanbury-Brown-Twiss Effect:
D. H. Boal, C.-K. Gelbke, and B. K. Jennings, *Reviews of Modern Physics* 62, 553 (1990).

●The only things that distinguish us from the rest of the animals, Madam, is our habit of drinking when we are not thirsty and making love at any time.

P.A.C. de Beaumarchais

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED



LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Val Lakey Lindahn

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

They say ninety-nine kids out of a hundred want to join the Space Force. If I ever got bitten by that bug when I was a kid I was sensible enough to forget it. Space Force only takes applications from kids Assessed in the top ten-thousandth of the population. Half of them get turned down.

Me, I was in the top 20 percent at my first Assessment. Later—well, I never fell below Average. They wrote "Could do better if he tried."

So how did I come to be breakfasting in the canteen at FarCry house, wearing a Space Force uniform?—the kind they call fatigues, which is a pale grey jumpsuit, more or less, but with a black insignia. At the top of the sleeve there's a row of three stars that stands for Space Force, I suppose—everybody has those. Underneath I wore a single thin circle with a fat dot on it, like the stone in a ring; and under *that*, in quite small letters: C(L-D)

Communications (Long-Distance). Ever since it was founded, fifty years ago now, the Space Force has been looking for a way to send messages that isn't limited by the speed of light. They made it a rule to test *every* suggestion and every claim, no matter how nutty. Three or four years ago it finally paid off. A method was demonstrated that worked over any distance, and didn't take any time at all, so far as they could detect.

Telepathy.

It had been proved possible centuries ago. It was just a curiosity, though, until it turned out to work between different solar systems, not just different rooms. *Then* the hunt was up for people with telepathy, and for ways to train them so that the thing could actually be made to *work*.

There was a lot of excitement about it. It was a way to get into the Space Force *without* being Assessed right at the top. Turned out, though, that telepaths were even rarer than one in ten thousand. The first year they tested fifty thousand people who claimed to be telepaths, and found twenty-three.

After that they went on testing claimants, but they also tested the top classes in high schools all over the world—about ten million kids every year. Fifteen to twenty of them turned up positive. The second year, one of them was Tina, my sister—half-sister. (Dad walked out on Mom and me when I was six years old.)

Tina and I weren't on speaking terms. I learned about it from the Rockwell Deep News.

It never occurred to me that I might be one as well. I mean, there were a good many times when, if I could have read people's thoughts, I'd have stayed out of trouble. Like, about six months after that announcement, I was making a delivery for The Man. I didn't know the fellow who collected it, but he had the right password. Then, when I reported back, it turned out he was a ringer.

It was the kind of mistake you don't always survive, but it turned out The Man wanted to meet Tina. C(L-D) was in the news again and he wanted to ask a few questions. It wouldn't have hurt her to play along. Instead she set off some kind of telepathic alarm—well, not on purpose, it was a bit of condi-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

tioning; she didn't even know it had happened.

Tina was the first ever to use it in earnest (and the last; it caused too much telepathic uproar)—so she got rescued in style; big floater with the Space Force logo on the side, armed guards, security officers, and Commander O.M. Rivers in charge: Mr. C(L-D) in person.

I got scooped up along with Tina. There was Old Man Rivers on the back seat, with me facing him. Telepathy runs in families; there are three other sibling pairs among eighty-seven C(L-D)s. So he tried it on me.

They call it Oral Testing. What happens is, you start coming out with the wrong words; pocket instead of packet, orphaned for opened; I forget the rest . . . made me feel pretty stupid.

Then he told me it meant *I* was a telepath.

Tina's been mad at me since she was ten, more or less, but what made her maddest of all was the idea of me getting into C(L-D) when she'd thought she was shut of me for good.

I wasn't sure I liked it myself. If people know you're a telepath they start acting funny—afraid you'll sneak their deepest secrets right out of their heads. (Might be a fringe benefit if you could, but it doesn't happen; *no* way can you get into someone else's head and rummage around. Even if you pick up someone else's thoughts by accident, and know it, there's no way to tell whose they are.) But I was on the run, more or less. My employer—I guess I should put "ex" in front—was just as mad as Tina, and a lot more dangerous. So when Rivers offered me board and lodging at FarCry House, on the condition that I took the official tests, I jumped at it. Space Force premises are guarded; they'd be overrun with sightseers otherwise. . . .

I hung around for a fortnight, doing tests and being interviewed by psychologists and so on, without saying more than maybe; but The Man was outside, waiting—or somebody would be waiting—for me to put in an appearance. In the end I signed on.

It took four days after I decided — interviews, indoctrination, preliminary instruction—but I was now a first year cadet. That was what the ring and dot stood for. Earth in its orbit. One year, get it? Took me several days to work it out, but at least I didn't have to ask.

My training was due to start that morning.

Fred Porter, Space Force Cadet. Wearing a uniform. Going to classes. Obeying orders. It just wasn't *me*.

I wasn't exactly thinking about it as I worked through breakfast; food in the canteen has rather more vitamins and fiber in it than I'd choose for myself, but there's plenty of it, and all free. . . . I do quite a bit of thinking from time to time, but not when I'm waiting for something to happen. It's not that I get strung up, exactly—I feel as though the bit of time I'm waiting in is never going to end, just go on and on halving itself like whatsisname and the tortoise.

So I can't say Tony Guiaccini interrupted my thoughts. He just gave me a hell of a start. He wasn't there when I lifted the coffee cup for a last swallow, and when I put it down he was leaning over me. I upset the cup.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"Stars' sake, Fred, get a move on," he said. "You're going to be late."

Tony had been nursemaiding me since the first time I came to FarCry House. Tina had stalked off without a word, leaving me more or less on the mat. I was wondering what to do and who to ask when this short, swarthy character shot out of a nearby office and took over.

I'd spent twenty minutes facing Rivers's insignia. I guess that was how come I noticed Tony's; the stars, with *three* dotted circles underneath. (He was a third-year cadet; I learned that later, and it was the chief clue that let me work out what the circles stood for.) But *no* C(L-D).

That ought to mean he was Regular Space Force. But that would mean he was one of Earth's very best and brightest; and I figured it ought to show. Allowing for the fact that he couldn't be more than twenty—I'm twenty-eight—Tony struck me as in about the same league as me for brains.

He was only assigned to show me around that first evening, but he went on spending time with me—professional interest; he was specializing in Communications and wanted to get accustomed to C(L-D).

"I thought C(L-D) was, you know, separate," I said.

"It is," said Tony. "But the messages have to be circulated through the system. Someone has to draft them, too."

"Yea," I said. "C(L-D)s don't have to understand them, I suppose, any more than a radio does."

"A radio *operator* doesn't have to understand," said Tony. "He can just read the words—spell them out, if necessary. C(L-D) is something else again. If the operator doesn't understand the message it may not arrive."

"But you can spell things out by C(L-D), can't you?" I asked.

"That's a worst-case stragtegy," said Tony. "It's slow, it's tiring and the operators get bored, which can shut down transmission. No, C(L-D)s have evolved their own methods. When you start training you'll see."

One reason I hadn't made up my mind, I didn't fancy being communication equipment for someone else. . . . Tony really was about as bright as people get; he just didn't let it show. Keeping telepaths in good order was going to be part of his job. What he said made sense, though; it wasn't only meant to make me feel better about C(L-D).

Now he had decided it was part of his job to get me to my first training session on time, but he couldn't make me feel good about that.

When I asked about the group I'd be training with I was told I could meet them *after* I signed up. They were five weeks into their training; no point in disturbing them if I wasn't going to join.

So I hadn't met Cougar Group until the day before. They were all *kids*; the two oldest barely eighteen. Ten of them, and seven were girls.

I'm not against girls, but they can be very tough on men when they outnumber them seven to one—the three boys were too young to count. Add to that, they were all well ahead of me. Tony had been teaching me the basics, but they'd had a lot of experience. I'd be holding them back.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I wasn't looking forward to the first session at all.

It was being held in Room SP4—SP for sound-proofing. I'm used to dwelling units cut out of solid rock; there's something about acoustical padding that makes me feel my ears have been put in purdah.

The room was laid out like a classroom: twelve chairs, the regular school model with screen and keyboard folded down into one arm, recorder and headphones in the other; and the instructor's chair facing the center of the row. Guess who got to sit there? And the two on either side were the eighteen-year-olds, Charity and Tsuling. Tsuling was a really proper young lady, Charity was a tease. I'd have felt a lot more comfortable sitting with the boys.

At any rate, thanks to Tony, I got there on time. Thirty seconds after I settled into my chair, Lieutenant Nakeda walked in.

Her uniform was charcoal-grey, with the insignia in white. There was something like a tassel on her arm, under the three stars—actually I knew it was a comet; Rivers had worn two—and no C(L-D).

Instructors were nearly always Regulars. Tony had explained: firstly, all the trained C(L-D)s had other things to do; secondly, none of them had been trained in teaching methods; thirdly, Regulars and C(L-D)s needed practice in working together.

We stood up and swapped good mornings with her. Everybody sat down.

"Transmission drill with use of call signs," announced Nakeda briskly. "Screens, please."

I was the last to get my screen into position and I caught Charity looking at me sideways. Dammit, I hadn't used one for twelve years.

"We will start by revising call signs," said Nakeda. "When your icon comes up on the screen, call it."

Tony had given me a list of the signs used by Cougar Group and helped me to learn them. All the same, I started to sweat.

The screen lit. Picture of two birds—one big, one small.

"Robinson," said the boy at the far end smartly. "Bird with red breast; one chick. Robinson."

It went along the line. Some of the signs weren't so easy to understand; for instance Tsuling had a man trying to push a dog into chasing a fox. The one after that—

"Porter," I said. My voice sounded rusty. I swallowed and tried again. "A man opening a door." Nakeda waited. "Porter," I added hurriedly.

Charity's surname was Brosnip and her icon was two boys pinching one another. . . . They were made silly on purpose, Tony said. A call sign mustn't be something that could crop up in the ordinary course of thinking, or that might form part of a message.

The ikons were just a teaching aid. Pictures don't transmit.

Nakeda was speaking again.

"Transmission drill. When the barriers come up put on your headsets."

I'd practiced, with Tony as sender —anyone can transmit, it's receivers who are rare—but something told me I was going to make a mess of it.

* * *

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Greyness rose all round me, out of the floor.

Tony had demonstrated the isolation system for me a week earlier, so it was no great shock. I hadn't noticed, though, that sound was cut off as well as sight. All the little noises disappeared—Charity fidgeting, the breathing of eleven other people, my own.

After about five minutes I started to wonder whether all the tests had been wrong and I wasn't C(L-D) material after all. I mean—eighty-seven in the whole world; was it likely one of them would be Fred Porter (Porter; man opening a door)—

Hold on—

Man opening a door. Blurr. Cup brought on a tray . . . Porter. Man opening a door—

Broughton, I thought hastily. *Cup brought on a tray, Porter. Man opening a door.*

About time. Did you speak?

Is that it? The message?

No. Blurr. Thing in a baby's mouth. Dummy. Did you speak to the recorder?''

Of course—there were a lot of non-C(L-D)s with transceivers and recording apparatus, directing the exercise from another room.

''Porter,'' I said hurriedly into my microphone. ''Man opening a door. Broughton. Cup brought on a tray.'' *Yes, I spoke.*

There are blurr for sale at blurr

What? Repeat. There are what for sale?

There are blurr—fruit, grows on a tree—red when ripe. There are apples for sale at Blurr—man with a hammer beating iron—Smith's.''

''There are apples for sale at Smith's,'' I said to the mike, with relief.

I discovered suddenly that I was drenched in sweat. How long had it taken me to make pickup on that call? What was I missing now?

I fidgeted in my damp fatigues and started to get cold.

''Porter! Look at your screen!''

''What?'' I said, startled. ''Er- sorry.''

The screen said simply ''Call Bakonde.''

That was the African at the far end of the line of chairs, with her hair divided into checkers; what the hell was her sign? It must have been the last to come up—Oh.

''Porter. Man opening a door. Bakonde—girl with her back to the rising Sun.''

I got her at the third try.

''Send,'' said the screen. ''Exploring party attacked by animal resembling crocodile.''

I did.

Wait. I have to speak the signs.

Sorry. I gave her ten seconds, and sent again.

Exploring party attacked by animal resembling crocodile

Repeat. Blurr party, celebration, blurr creature of some kind.

Group of people gone to see new country, exploring party, attacked, violence, attempt to hurt, attacked, animal like a crocodile—long snout, big teeth, thick skin, goes in the water.

Repeat message.

Exploring party attacked by animal resembling crocodile.

Exploring party attacked by a crocodile.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Not a crocodile. Something like a crocodile, real crocodile negative.

Exploring party attacked by a ghost crocodile.

"Finish sending," said the screen.

I'd had one go at receiving, one at transmitting. I thought I hadn't done too badly.

Man opening a door. Porter. Two birds. Robinson

I repeated that for the mike.

Witch with cauldron, words. Spelling.

"Spelling," I said aloud.

Ball. Rose. Orange

I was repeating each as I got it—the procedure for this exercise, according to the Manual. Hallo, I thought, is it going to be Broughton?

Blurr.

Repeat I thought back. U was Uncle; icon, a fat man patting a boy on the head. The blurr might have been *Man with boy*, but—

Blurr Damn. I hadn't switched my thoughts off fast enough.

I decided to chance it. "Uncle," I said.

Nuts

Perfectly clear. Broun. *Not Broughton. Probably not 'Uncle' Hell. What now? . . .*

"Porter. Cancel. You're causing interference. Chop . . . Recite your verse."

Standard method of getting off the air when you were upsetting transmissions, it was in the Manual, but everybody had a different verse.

I said, "I haven't got one."

"Recite the multiplication table, then. Silently."

I was in such a state by then I could hardly remember it. *Twice one are two, twice two are four, twice three . . .*

I was on *six times seven* when the grey barriers suddenly disappeared.

"Well," Tony said at lunch time, "how did you get on?"

I tried to guess from his expression whether he'd heard anything from the others.

Nakeda had gone round the group, playing back the recordings, telling each of them what they'd done wrong— Robinson, for instance, should have given me his sign in full; some day someone else might have one that abbreviated to "Two birds".

"Cadet Porter," she said, and paused. "Your procedures were sloppy. I will arrange extra practice. During the alphabetic transmission you began guessing ahead, confused yourself, panicked, and ended up by disrupting transmission throughout the group. It was a classic example of the difficulties that occur when you don't stick absolutely to the rules. What should you have done when you realized your first mistake?"

Ten pairs of eyes were turned on me. I hadn't the faintest idea what I ought to have done.

"Cadet Bakonde?"

"He should have called for an abort and a new beginning, ma'am."

"Correct."

I broke down and told Tony about it, in the end. I thought he'd say something like everybody makes mistakes at the start, pretty tough to jump on you when you're five weeks behind.

Instead, he frowned.

"You know what your trouble is,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Fred? You don't *try*. You take the easy option, every time. You knew what the drill was; you'd practiced it. You could have done it perfectly. Instead, you played at being the new boy who didn't know his way around."

"The hell I did," I said indignantly.

"The hell you didn't. You took down five spelled-out messages yesterday and the last four were perfect. All right, you were nervous, but you didn't have to make a meal of it. You were just telling Nakeda not to put pressure on you by expecting too much."

I stood up and said, "I don't have to listen to this."

"Oh yes you do—cadet. I'm senior to you. Sit down."

I dithered resentfully, then sat.

Instead of speaking, he just sat there frowning—not at me, at his thoughts.

"Telepaths," he said finally, "seem to turn up with the full range of other abilities—all the way from moron to genius, athlete to cripple, perfect pitch to tone-deaf."

"I haven't seen any geniuses," I said.

"I know of one, but she's not in C(L-D). We haven't any top athletes, either. They can do better for themselves elsewhere." He scowled some more.

"The Space Force," he went on "is recruited mostly from bright kids who are physically fit, hard working, disciplined, and get on with each other. Some people think it's a kind of reward for virtue. Actually it's because the crew of a space ship, not to mention a survey team on an unexplored planet, is more likely to survive if the members are like that."

"Tell me something I don't know," I said.

"No, I'm going to say something else you've heard before. C(L-D) Section will take anybody they can get with the primary qualification, because functioning telepaths are so rare. So in the future ships are going to take off with people on board who are less qualified to be there than the rest of the crew.

"That's bad, because it increases the risks for everybody. So it's important that C(L-D)s train to reach the highest standard they possibly can. They aren't allowed to slack off as long as the Instructors think they can take just that little bit more. You're above average intelligence, you're big and strong, there's not a reason in the world why you shouldn't be one of the best qualified C(L-D)s in the service. If you try goofing off you're in for a lot of grief."

"Hell," I said, "I'll apply to move down to Lynx Section."

C(L-D)'s intake for the half-year had been divided into two sections. There was a kind of half-hearted fiction that they were both equal, but everybody knew that those in Lynx Section had been Assessed somewhere in the bottom 45 percent of the population. Their C(L-D) training was the same as Cougar Section's, but they did a lot less of the general Space Force stuff.

I meant it as a joke. Well, maybe not so much a joke; more a gesture of defiance. The one thing absolutely taboo in FarCry House was to hint that any C(L-D) was inferior to any other, or to the Space Force at large.

We weren't supposed to even *think* it. Insulting a C(L-D) didn't just cause

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

bad feeling between colleagues. You could put a telepath out of action by hurting his feelings badly enough, especially if he got hurt through his telepathy. So you had to be even more careful about what you thought than what you said.

Lynx Section was perfectly aware that they were less than average bright. There's a big difference between being aware of something and having your nose rubbed in it.

So I shouldn't have said it. In fact I wondered why I had been *able* to say it. I thought the conditioning would have seen to it that I couldn't.

Tony's eyes had gone small and hard. They bored into me for several seconds; then suddenly he shut them and his lips began to move.

I stared. "If you want to curse me, do it out loud."

Tony's eyes opened. "Chop, you idiot," he growled.

I blinked. Then I realized that the longer we went on thinking about my faux pas the more risk someone from Lynx Group would make pickup on it.

I started on the multiplication table again.

In the afternoon most of Cougar Division had sports, but it was optional. I made an appointment with Casperson, instead.

FarCry House had eight resident psychologists, and I must have seen all of them, but Casperson was the only one I felt comfortable with. I don't know why; several of them were more fatherly, or motherly, and he was on the impersonal side—maybe that was it. I don't have much of a record with fathers; and if you're airing something embarrassing you don't want it taken personally.

"I think my conditioning is breaking down," I said.

Casperson looked thoughtful for a while.

"Which conditioning is this?" he said finally. "When did you get it?"

"Look," I said, puzzled, "I'm talking about the conditioning I got when I signed on. You know, to keep my antisocial trends under control."

He looked thoughtful some more.

"This really isn't my speciality, Fred. Who administered it?"

"How would I know?" I said. "At the end they tell you to forget all about it."

He frowned a little. "It's illegal to administer conditioning without the subject's knowledge and consent."

"Well, I'd have consented if they'd asked me. Everybody knows it's part of the package when you sign on. Maybe they did ask me. If they told me to forget all about it I'd have forgotten *that*, not so?"

"Of course. Well, what makes you think it has started to break down?"

I told him what I'd said about Lynx Group.

"Yes, I see," he said. "That is a serious matter in this particular context, of course, but it hardly comes under the heading of antisocial behavior in general. Possibly when the conditioning was installed the operator felt that such things were better left to your own good sense and good feeling, Fred."

That didn't make me feel good; in fact I felt lousy. "Can you get them to put it right?" I asked.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

He stroked his lips with one finger. "Hardly. It is not at all advisable to tinker with conditioning once it has been installed. No, I'm sorry, Fred, you'll just have to watch out for that sort of thing yourself. You can consult somebody else, of course, if you like—Dr. Wen, perhaps, it's more her field than mine—"

"No, thanks," I said. Wen was one of the motherly ones. I'd known it was a bad thing to say and I'd gone right ahead. That's not the sort of thing mothers understand.

I was getting ready to go when I happened to noticed his bookcase. There were several books in it with "Poetry" or "Verse" in the titles.

I said "Another thing. Nobody gave me a verse."

He didn't seem to get it and I had to explain.

Casperson said "Ah. Yes. Well, I should imagine the verses are not precisely an official issue, Fred. You could probably choose your own."

"I never went in for poetry much," I said.

He nodded thoughtfully. "Well, perhaps . . . Not too lengthy, I imagine, but you would want more than four lines. An emphatic rhyme scheme, to hold the attention." He fished out a book and flipped over the pages. "How about this?

"There was a naughty boy, and a naughty boy was he. He ran away to Scotland, the people there to see. But he found that the ground was as hard, that a yard was as long, that a song was as merry, that a cherry was as red, that lead was as weighty, that fourscore was as eighty, that a door was as wooden as in England. So he stood in his shoes and he wondered. He wondered. He stood in his shoes, and he wondered."

"That would do just fine," I said. It was silly, like the call-signs, but a classy sort of silly; I liked it.

He ran off a photocopy. I thought I might as well look in at the sports grounds, so I put the copy in my pocket and wandered along.

The sports officer was a regular sergeant (Moon with two ships in orbit); he'd been on three voyages, but was grounded by regulations when he got to fifty. I'd got to know him quite well. He seemed pleased to see me.

"Cadet Porter!" (Before I signed on he'd have said "Hi, Fred"). "How about some judo? Got just the right partner for you."

I'd done some judo at school, before I dropped out, and tried to keep it up when there was a gym handy. Trouble was, I'm six-two. I couldn't give a real expert a match—he'd throw me off the mat even if he was only five feet tall—and people in the middling range weren't keen to tackle me in case they strained something.

I wondered what the Sergeant was up to. Then my prospective partner shambled out of the changing room.

He was Bernie Lossoch, 6′5″, 216 pounds. The big lout was one of the dummies from Lynx Group; if he won a bout it'd be by falling on top of his opponent—

Oops. Damn. *There was a naughty boy, and a naughty boy was he. He ran away to Scotland—*

Bernie didn't seem to have made

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

pickup, I was relieved to see. He gave me a shy grin.

"I like judo," he said. "Don't get much chance to practice, though."

I hadn't heard him speak before. His voice was surprisingly soft.

"I'm pretty rusty," I said.

"Chance to brush up, then," said the sergeant briskly. "You'll find costumes in the changing room."

I got a lot of practice in falling that afternoon. Bernie had all the throws I knew, and counters to them, and he was lighter on his feet than you'd expect. He used my weight to throw me, which is the proper thing in judo; trouble was, when I tried to return the compliment, *his* weight was more than I was accustomed to deal with and usually more than I could handle.

For some reason, however, the sergeant was pleased with me.

"Bit of practice and you could really give him a game," he said.

Even when you know how to fall, being thrown around for an hour or so takes it out of you. About the last thing I wanted was to give Bernie Lossoch any more games.

"You know," the Sergeant went on with enthusiasm, "with some real practice, regularly, it'd be worth entering him in the InterSection games. There's most of four months before they're held."

"Don't they have weight classes?" I said feebly.

"Yes, but there's the Open event. Bernie's not quick, but once he learns something it stays learned. It's no good trying to tell him things, though, he has to do 'em. I'll teach you the advanced throws, and the counters, and you can do them with him, and in three months you won't know him."

"But," I said, "it would surely be a lot better if you taught them to him direct."

The Sergeant sighed.

"No good. I've tried that. He's afraid of hurting me. He's a gentle lad, Bernie. But he won't worry about a big strong chap like you."

"I don't get it," I said to Tony that evening. "The sergeant was practically drooling over the idea of getting Bernie into this Games affair. What's the point? Don't tell me he believes he could actually *win*."

"Sergeant Krantz's ambitions don't go that far," said Tony. "He just wants one solitary athlete he could enter without being made to look a complete fool. There was a possible last year, a girl who could have done quite respectably in the four hundred meters, but she shipped out in *Flammarion* a fortnight before the Games. It's not as though the other sections were teeming with world-beaters—no one has time for that kind of all-out training—but their effectives were selected for physical fitness as well as other qualifications. It's no wonder he grabbed you with screams of joy. You're a better physical specimen than 95 percent of C(L-D)s, however badly out of condition you are."

"I never set out to be a body-building nut," I said stiffly.

"Pity," said Tony. "Your life would be a good deal easier right now if you had."

That was no lie. The Sergeant allowed me one day to get over stiffness and bruises; then he started calling me

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

an hour early, to run round the perimeter with him before breakfast.

FarCry House stood in the middle of 200 acres. The first morning I staggered in blown and sweating, having shambled through the second mile a hundred yards at a time, and feeling that to do it again would kill me.

Over breakfast I tried to convince myself that I was going to look the Sergeant in the eye and say "I quit." No dice. Sure, participation in the sports was voluntary. I just knew I wasn't going to refuse. Not because I couldn't bear to disappoint the old man. Not because I couldn't face the scorn in his eye. Because I knew deep down that it wouldn't work. Somehow he would see to it that I went to the mat with Bernie just as often as he thought I should. Knowing that, I could shoot myself, or I could desert, or I could bite the bullet and pretend I liked the taste. What I could not do was tell the Sergeant I was exercising my inalienable right to goof off, even if I kept my eyes on his boots.

How the hell had I got myself into this? Fred Porter, who at the age of seventeen had left school, home, and family, sooner than knuckle down to that hillbilly my mother married the second time around, with his pre-Disruption ideas about working for your living and giving value for money and paying your own way. . . . Here I was, wearing a uniform, following orders, losing good sleep to pacify an old idiot who'd roped me in to waste a lot of energy on something I didn't give a damn about and that hadn't a hope of success. . . .

Any more than Nakeda had, trying to turn me into a good little C(L-D). Yesterday's Transmission drill had been a complete mess. I'd gone strictly by the book, calling for repeat transmissions three times, holding everybody up; and in the end it turned out that Charity had been sending *The Colonel orders all exploring parties to return to base by 2500 hours*.

What had got me confused was *exploring parties*, which I'd transmitted myself only the day before; Charity had been using a different amplifier, or two of them: *looking around* and *celebration*. They were on the Manual list. Why hadn't Nakeda pointed out yesterday that the one I'd made up was wrong? . . . And the alphabetic transmission—I got it, finally, but Juana Garcia *(fish with a long snout, telescope)* had been wrung out and had let me know it.

Face it, this kind of life just wasn't my bag.

On the other hand if I just went AWOL it would be a race between Space Force and The Man to grab me first.

Stick it out, then, till I could work out a damned good escape plan; where to go, what to live on when I got there, who to be. Meanwhile be a good little cadet. Don't raise suspicions. Keep my mind on the job—

My *mind!* I'd forgotten I was surrounded by telepaths.

I looked around . . . and caught Tsuling's eyes fixed thoughtfully on me. Thoughts can leak—I knew that from personal experience. . . . *There was a naughty boy, and a naughty boy was he*—

It didn't matter if she made pickup on that. Trouble was, it stopped me from thinking about anything else. We

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

were due to get training in setting up a proper shield for our thoughts instead of just jamming them. Better not try to make plans until after that.

I sighed with relief at having got that settled. Tsuling had gone.

Porter; man opening a door. Tsuling; man setting a dog on a fox. You are going to be late for class.

I ran for it.

My decision meant that I had to try and keep everybody happy for the time being, including Sergeant Krantz. Every morning, therefore, I flopped groaning out of bed, slouched out to the perimeter, and spent more energy than I really had getting back to where I started. Three times a week I spent half an hour being bent into unlikely positions and throwing 150 lbs of training dummy around; after which I spent an hour with Bernie, demonstrating what I'd learned and then playing the part of the dummy myself. Every next time around the Sergeant taught me the counter I *should* have used and had me pass that on.

I began to make friends in Cougar Group. Funnily enough Tsuling was the first; her good manners wouldn't let her be on bad terms with a colleague if she could help it. Charity teased me, calling me "Uncle Fred" and pretending to tweak out my grey hairs for souvenirs. I patted her on the head and called her "Little girl" and she got tired of it. The others started to think I wasn't all bad when they heard I was doing judo with Bernie; they thought it'd be great to have a competitor in the Section Games.

Altogether I didn't have time to work out plans, not even after we began exercises on Shielding Technique. This was not much like my idea of a shield; it was more that you kind of diverted thoughts into another dimension where they wouldn't connect with anyone else's mind—maybe a dimension like the extra dozen that come in some theories of cosmology, which don't get noticed because they are kind of curled up out of the way.

I never did understand that, but it makes a handy metaphor. I got it from a talk by the Old Man. (We called Rivers that partly because he was Head of Section, partly because of his name. He was younger than me.)

We didn't see a lot of him. Tony said he was busy at the Space Gate, trying to teach the rest of the Space Force how to work with C(L-D). When they heard he was going to give a lecture the rest of the Cougar Group went wild with excitement, even Tsuling.

Can't say I felt like that about him. I'd seen him for longer than any of them—they'd shaken his hand when they signed on and that was all. He struck me as a nice enough guy. Probably OK to work with, or to have working for you. Boss of something that might double or treble the rate at which humans were moving out into the Universe—no. Obviously C(L-D) had to have a telepath at the head, and there weren't many to choose from, so he'd got the job. But *exciting*—?

The few times The Man spoke to me to me face to face I felt every nerve ending in my body come to attention. Mind, I won't say I *liked* the feeling.

Just about everybody in the House crowded into the big hall. I saw Tina

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

with Panther Group—first time I'd laid eyes on her, except once when I got to the canteen just as she left. We didn't nod.

Rivers's lecture was billed as "Telepathy and the Physical Universe." As a speaker he wasn't bad. You could hear what he said. It didn't exactly grip me; but afterwards I was surprised how much I remembered and how bits tended to pop up in my mind.

Like human beings evolved using speech as their main method of communication. Telepathy was not one of the brain's main functions but a sort of by-product of consciousness. We didn't have any instincts about how to use it. It was up to us to find out what we could and could not do with it, and which ways of using it were a good idea and which were dangerous.

Nobody knows the nature of the connection between the mind and the brain. But since we are used to thinking about the Universe in terms of matter and energy in a space-time continuum, it can be useful to think about minds and consciousness operating in a space-time continuum of their own, where the laws are fixed all right, but not the same. For instance, you can think of making pickup as your mind coming in contact with another through a fold in the continuum. A C(L-D) sending to a receiver is setting up a fold on purpose, but an accidental pickup on a stranger's thoughts would be when you just happen to touch opposite sides of a fold without knowing it was there. It doesn't matter how big the folded part of the continuum is; could be a hundred light-years across, or a thousand. The two sides of the fold still touch. Transmission across them still takes no time at all. A distance that is very long indeed to a spaceship, and even longer to radio waves, can be no distance at all to a telepath.

I hadn't come up with any plan to get safely away, so I was still being hauled out of bed at six o'clock to run round the perimeter. I was kind of used to it by now; I could switch my mind off my legs and just think about the hot bath and big breakfast I'd have when I got indoors. One morning as I was homing on the front entrance I got a sort of telepathic jab.

Fred! Look behind you, will you?

I did, and there was Tony. I hadn't been seeing much of him lately—he seemed to be spending a lot of time at the Space Gate.

"You went past me like a racehorse in the last stretch," he said. "Where's the Sergeant?"

It occurred to me that it was quite a while since I'd seen the Sergeant at the end of the run.

"Chasing up someone else, probably," I said. "Something wrong?"

"Well, no," said Tony. "And then again, yes. I wanted to say goodbye. I'm being posted back to Space Gate."

"Hell," I said. "You mean I won't see you again?"

"Sure you will. From time to time. I just won't be part of the landscape hereabouts." He turned and took a long look at the facade of FarCry House.

"It's screwy," he said, "but I believe I shall miss this place."

I'd got used to the House. When he said that, though, I remembered how it looked to me the first time.

Like I said, I was never any kind of

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Space Force buff, but somehow I must have laid down an idea of what kind of buildings the Force would use; because FarCry House wasn't it.

I was used to topside houses—I lived in one myself for five years. Mum's second husband bought it, falling down; it took him two years to make it habitable; then after he moved us in he spent another four years fixing it up. Then he died—well, two years later; I was back in Rockwell Deep by then. Point is, I'd seen plenty of *buildings*, put up any time from five centuries ago to yesterday, but never anything like FarCry House.

Well, maybe I had in a way, because what it looked like was a couple of dozen pre-Disruption houses all joined together in a row. There were a couple of towers at the two ends, the sort with a roof like a witch's hat, and a square one in the middle with that missing-tooth effect at the top.

It was old—a century and a half old when the Disruption happened. Some person with more money than sense had it put up, imitating some place in Europe. After he died it was a school, and a hospital, and a looney-bin. During the Disruption, who knows? Any place with a roof on got used by whoever was around. The builders must have done a good job, because it never quite fell down. Then the state claimed it for back taxes, and twenty years later Space Force got it cheap.

It suited C(L-D) quite well—plenty of rooms, all sizes, and good thick walls. Space Force had put a couple of ten-foot wire fences round the grounds, fifty yards apart, with gates and guard-boxes and alarms and all. I hadn't seen those but once, the night I came, but they made me feel safe—I don't say The Man couldn't have got someone through the defences but he wouldn't think it was worth the trouble, not for me.

"You must be one of Communication's top experts on C(L-D) by this time," I said. Just for something to say, but it was true—there were several other cadets in Communications who'd spent some time at FarCry, but they didn't seem to take it seriously.

Tony gave me a look I didn't understand.

"You could be right," he said. "Did you mean to make me feel good? C(L-D) is the most important thing that's happened to Space Force since the Mass-Time drive, but how many Regulars have you seen here?"

I was puzzled. "You mean Regulars don't care about C(L-D)? I thought it was supposed to make things a lot better for them."

Tony sighed.

"Look, Fred, Regulars aren't all the same. One way they split is those who are away on expeditions and those who stay home. The ones who've been on expeditions since C(L-D) started think it's great just the way it is. The stay-at-homes at Space Gate in Rockwell High think the head of C(L-D) should have been appointed from among *them*. He'd soon get rid of this nonsense about the rest of a crew having to fit in with their C(L-D)s, instead of the other way around; and not being allowed to haul a C(L-D) on the carpet and relieve your feelings when he boobs."

I said "But don't they know—"

"No," said Tony. "They don't want to know. Rivers was appointed to the Space Force with the rank of com-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mander when he was twenty years old. Do you know how old the average lieutenant is before he gets promoted? And the ones at the Space Gate are mostly average. The best are out in the Hyades or around Fomalhaut right now.

"At least two of the officers who *didn't* get to go on those expeditions had been involved in incidents with C(L-D)s. Trying to enforce discipline in the wrong way at the wrong time. They weren't reprimanded, but the admiral had a talk with both of them in Rivers' presence. They think that's why they were passed over. . . .

"The general idea is that C(L-D)s can be bad medicine where chances of promotion are concerned, so people keep away from 'em. If you show interest you're accused of trying to bootlick the admiral. There's a faction building up to get him replaced."

"Can they do that?" I asked, startled.

"You're asking me? I'm just a cadet. Admiral of Space is a political appointment—United Nations. In theory it's for life, but he might be forced to resign. One way to do it might be to convince the general public he'd appointed someone incompetent because of personal friendship. There's a story going around that Rivers's father is a friend of his—"

We became aware of feet pounding on the turf near by. The sergeant went by us at a steady trot.

"You'd better get in to breakfast," said Tony. "Take care of yourself, Fred. I'll see you at the InterSection Games, if not before."

Ten mornings later I was halfway round the perimeter, with the sergeant about a hundred yards behind, when I felt a sharp pain in my arm. I stopped to investigate and felt another sharp pain in my calf. A big fly, grey and stripy, with brick-colored eyes, settled on my right forearm, and as I moved to brush it away I felt the pain again, where the fly had been.

There was a small knot of moving dark dots in the air, making for me.

I turned and ran, waving my hands about to discourage any flies that might choose to follow. Maybe it did; I think the one that got me on the butt had crawled up my shorts earlier on. I stopped to mash it, a few yards from the Sergeant, who had halted and was gazing at me with mild surprise.

"Flies!" I shouted. "They sting!"

He turned as I reached him and began trotting alongside. "What kind?"

I described them in short bursts. He nodded.

"Horse flies. Must have come through the fence from that scrub on the far side. I'll send for a spraying team. Don't scratch. Better see the MO."

The MO looked in each morning; he didn't get a lot of work at FarCry. He was mildly interested in my three punctures and asked how I got them.

"Stung by horse-flies," I said.

"Bitten," said the MO. "Flies don't sting. They bite."

It was news to me that flies had teeth, but I took his word for it. He used a hypospray on each spot to kill the itch and told me to come back and use the Autodispenser if it started up again.

In the next two days I used it a good many times. If there's one thing you don't want when you're trying to filter out the message that concerns you from three or four aimed simultaneously at

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

other people, an itching spot is that thing. Your classmates don't want it either. By the third morning, which was the day of the InterSection Games, the spots had all faded except the one where I sat. That felt like it was starting to grow.

I went along to the MO's office. He wasn't due that day, since just about everyone was going to the Games; but the Autodispenser was unlocked. I typed out a request for the itch-reliever.

The thing hummed for a bit. Then the screen came to life.

AUTHORIZATION OUT OF DATE. INSPECTION REQUIRED. TAKE OFF CLOTHES AND STEP INSIDE.

I cursed, but obeyed. Something like cobwebs brushed over my skin, then there was a slightly more tangible pressure round the spot.

WOUND INFECTED

came up on the screen.

Of course it happens, especially if you go topside. All the little whatsits —pathogens—that evolved specially to invade man have been reduced to frozen cultures in a heavily-guarded lab somewhere on the Moon; but a hole in your hide is a whole new ball game. Things that normally make a living in the soil find their way in and whoopee! the living is easy—until somebody slams in a dose of antibiotic or the old white corpuscles bustle up and start to feed. I just never expected it to happen to *me*.

ADVISE INJECT LUCANTRICIN 500 UNITS

said the screen; then in smaller letters

AGREE/ DISAGREE/ NEED FURTHER INFORMATION.

I pressed the button that said "Agree." The word came up. A moment later

AUTHORIZATION BY MO REQUIRED

Hell.

I stared at it for five seconds; then it said

MO TYPE AUTHORIZATION CODE PLEASE

Damn it, the MO wasn't *there*. . . . Nobody else in the building was likely to know that code. . . . When the MO typed in instructions he had told me to turn my back and added something else. The authorization code? but . . .

A string of letters and numbers wandered into my thoughts. I had no reason to think they represented the code, but there was no harm in trying. . . . I typed them in.

PREPARE FOR INJECTION

said the screen.

Great balls of fire. I certainly hadn't tried to make pickup on the MO's thoughts . . . not consciously. I'd learned screening—keeping out other people's thoughts when I specifically didn't want them; it worked a lot like shielding, but not quite. However, I didn't bother to screen all the time. Stray thoughts might seep in without my noticing. Or maybe my subconscious had decided that I might need the information some time and sneaked it in when my conscious wasn't looking. Anyway, there it was. . . .

The coldness of the spray was followed by a brief burning sensation; then the goddamn itch finally stopped.

We were due to leave for Space Gate at 0800 and I didn't have much time for breakfast; fortunately I wasn't hungry. I swallowed some coffee and a bit of toast and hurried to the string of big floaters out front.

It was the first time I'd been to Space Gate. The buildings were just about

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

what you'd expect—high tech, high finish and just plain high. Seeing them far off as we passed the first fence I thought they looked like the kind of model kids put together from a kit, but close up they were real enough.

We drove past them to a big open grassy area. Bernie, sitting beside me, got excited because he thought it was where the space ships took off, but that was about a mile away on the far side. We could just see the launching pylons sticking up—no ships.

Bernie didn't seem excited about taking part in the Games. If you do judo properly, with the spiritual element and things, you're supposed to stay calm and dignified beforehand. I guess he'd learned how. I never did. For some reason I was all keyed up, although *he* was going to do the fighting. I felt hot and a bit sick. I was glad when the floater settled to earth and let us out.

The Sergeant took Bernie off to the competitor's area and the rest of us climbed up into the bleachers. The races came first. It's not much fun watching when you don't know who the people are; a public address system kept trying to tell me, but I had difficulty taking it in. Somebody from Communications won the 400 meters and I felt I ought to be pleased, because of Tony and because C(L-D) was linked to Communications, but my head was starting to swell up and float away and I had to concentrate on keeping it where it belonged. Then the 1,500 meters was announced and I suddenly knew I had to get out of there. I blundered past a few people—fortunately I was fairly close to the gangway—and stumbled to the exit.

There was a toilet block behind the bleachers and I made for it as fast as I could. I fell through the door and groped my way into a cubicle, then my mouth filled with foul-tasting water and something even worse rushed up my throat and shot out on to the floor.

I'd thrown up a couple of times when I was a kid, but I couldn't remember anything like this. Heat and cold washed over me one after the other. My legs felt like jelly and I was afraid of collapsing into the mess on the floor. I didn't understand what was happening, unless I was going to die. Maybe that was it. Maybe The Man had got someone into FarCry House to poison me. I was going to die all alone and no one would know why. I needed someone. . . . I needed *help*.

Things started going round and round. Somehow I reached the seat and folded on to it. Great blobs of icy sweat had come out on my forehead and trickled into my eyes. It stung . . . I didn't want to die in a toilet cubicle with vomit on the floor, but I didn't know what to do about it.

Somebody, help me . . . come . . .

Through the dizziness I was vaguely aware of sounds. Door opening. Closing. Footsteps. Then a bang as the door slammed against the wall.

Voice. Angry. "Rivers! I want a word with you."

Quiet voice. "Later, Jangir."

"Now, dammit! And don't turn your back on me! I'm told you had the impertinence to go over the CO's head and complain to the admiral, after I told that oaf Weidman what I thought of him."

I heard the words—I remembered them later—but didn't take them in.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

What did register was the call that came simultaneously: *Rivers. Running waters. Sick man. Where?*

"Captain Jangir, it is laid down in Standing Orders that any complaint concerning a C(L-D) is to be made to me, not to the C(L-D) himself."

If you've been drilled often enough to respond to a certain signal in a certain way, you do it, if you're alive. I wasn't dead, yet.

Porter. Man opening a door. First cubicle. Aloft.

Emotions don't transmit, but transmitted words can set them off. Strong emotions can mess up reception—even knock it right out. Therefore certain words are banned. *Death* is one of them. So is *dying*. C(L-D)s use *Aloft* instead. Sure, it means exactly the same, and we all know it; but it doesn't have the same impact.

Rivers's voice didn't miss a beat.

"After your run-in with Weidman he was out of action for a day and a half." *Come out if you can.* "Standing Orders also state that any incident which impairs a C(L-D)'s usefulness is to be reported to the admiral immediately."

I heaved myself off the seat and staggered forward. My foot slipped on something and I crashed head first into the door. Somehow I stayed on my feet, got it open, and dragged myself through.

There were two men outside, Rivers and a big dark-skinned man with a black beard curled under his chin. I could see he was in a black rage, too. Then his jaw sagged and his eyes went circular. . . . There was a big mirror over the washbasins. I got a look at myself and saw why.

I tried to say something—an apology, maybe, for appearing corpselike in the presence of superior officers—then my legs gave way under me. I slid to the floor gratefully away from it all.

It turned out I wasn't dying; just sick. Since the antibiotic the MO ordered hadn't stopped one of my bites getting infected the Autodispenser had injected a different one, and I was allergic to it.

Bernie came to see me in the sickbay. He had won two bouts and had been knocked out of the quarter final by the man who came out on top. He took it calmly, and didn't quite understand why everyone else was cockahoop.

Tony didn't come. I was a bit hurt, till I learned he had been sent to the Moon for vacuum and low-grav experience, the day after the Games.

Rivers didn't come while I was conscious, but the MO said he had paid a brief visit of inspection before I woke up.

The whole of Cougar Group came, singly or in pairs. Being sick is not a common experience these days; they all wanted to know what it was like. Seems there are people—historians and such—who go to a doctor to be *given* a sickness, so as to know what our ancestors were complaining about. They could have had mine and welcome.

After three days I was allowed back to class. We were judged OK on shielding, screening and filtering, so Nakeda started us on interfacing with other Groups.

Lynx Group first. I kept *There was a naughty boy* handy, but I didn't need it; they were as smart on call-signs and amplifiers and so on as the rest of us. We practiced together in SP4; then with

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Lynx Group elsewhere in the building, and then with people scattered round the grounds—that one was a lulu for the people masterminding it with their recorders and computers, because from some angles there was trouble with radio reception. Then, when we were all familiar enough not to need call-signs, just names, we were interfaced with Panther and Leopard, the two groups six months ahead.

They were on to Space training, full-time. Finding your way around the different classes of ship; techniques for living in them; commands a C(L-D) might need to obey, like the rest of the crew. Cougar had done some of it on computer simulations, but the Seniors went out to Space Gate and practiced in the mockups used for training Regulars, whenever one was free.

Panther and Leopard were still quartered at FarCry House, though, and had classes there several days a week. We went through the drills with them, everybody calling and receiving at least twice with everybody else. With two sets each about twenty strong it took time to arrange all the pairings. I was on edge, waiting for Tina's call-sign, or for her name to come up on my screen. I was slow on a couple of pick-ups and got comments I didn't repeat for the record. After that I kept my mind on the job.

Around the end of the first week I made a pickup: *Harrison, Viking and boy. Porter. Man opening a door.*

I kept my old man's name; Tina used her father's. I knew what her call-sign was, of course, but recognition didn't strike till I acknowledged it.

We both kept it very professional. No side comments at all. Next day it was my turn to act as sender. She picked up straight away, the whole message. No amplifiers needed. We didn't really need to use call-signs. Contact improves with familiarity. Whatever else, Tina and I were about as familiar as you can get.

After the senior groups, the world; meaning every other known C(L-D). If there ever get to be hundreds of us I suppose it'll be different, but as things are we make contact with everybody else in the Section, often enough to recognize them—ten years hence, in a panic, from fifty light-years away. The drills had to be set up very carefully; contacts assigned to expeditions called outside contact periods; long calculations involving relativity to make sure we didn't wake the C(L-D)s on ships in flight in the middle of local night.

Rivers just called one of us whenever he had a free moment—during someone's speech to a committee; waiting to see the admiral or some highup in Personnel; standing in line to speak to a clerk in Finance or Supply. We weren't allowed to call him—we might distract him in the middle of something delicate—but he called each of us at least three times. He might be head of section but he was like the rest of us, part of C(L-D).

All of a sudden, it seemed, things started coming to an end. Panther and Leopard groups passed out as fully-fledged C(L-D)s, ready for assignment. Cougar and Lynx groups moved up to Senior status, and we all got a fortnight's leave.

I didn't know what to do with mine. There was nowhere I wanted to go. Sev-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

eral others were in the same boat—friends and even families often react badly to learning they've been harboring a telepath. FarCry House stayed open for us and games and excursions and stereo shows were laid on. Felt funny, though, with no classes. The second morning I went back to running round the perimeter, alone—the Sergeant was on leave, too.

On the fourth day a few of us were drinking coffee in the canteen when Tina sat down opposite me. The others took the hint and left.

I said "Coffee?" Tina shook her head.

I waited. After a full minute, "I've been assigned to *Grimaldi*," she said.

Grimaldi had returned from Tau Ceti three weeks before and was being recommissioned to go back, with new equipment and extra personnel.

"Congratulations," I said. It was assumed that shipboard assignments were what everybody wanted. Mostly it was true.

"I went to see Mother," said Tina. "She said she hasn't heard from you."

"Did she want to?" I said. The last news Mom had of me was that I'd hauled Tina along to see The Man, half by force and half by moral blackmail—at least I assumed that was what she'd been told. Mom has forgiven me a lot, but I doubted it would cover that.

Tina was turning an abandoned cup round and round in its saucer.

"All she knows is that you were diagnosed as a telepath," she said. "She lived me down, and she seems to think she can live you down as well."

"You didn't tell her, then?" I wasn't all that surprised, when I came to think about it. "Thanks."

"There was no point in upsetting her." Tina sat back and looked me over. "You've kept out of trouble for six months," she said. "That must be a record."

When Dad cleared off and left me as man of the house, aged six, I kept out of trouble for more than two years. It was after Tina's father took over that I started playing truant and hanging around with the wild bunch. I didn't tell her that.

She gave the cup another turn and then pushed it away decisively. "That man you were working for—was his name Fratricelli?"

I had to think for a moment. "Yes. Why?"

"He's being investigated. It was on the news."

Once I knew he hadn't stretched a long arm into FarCry House and poisoned me I stopped worrying about The Man. I'd admired him and feared him, I remembered that, but now the news just echoed off a sort of blank.

I suddenly realized Tina was talking. ". . . So there's no reason why you shouldn't go see her, is there?"

Who—Mom, of course.

"You sure she'd want to see me?" I said.

"Haven't I just said so?"

"Right," I said. "I'll go. First chance I get."

Grimaldi took off a fortnight later, with Tina and two other C(L-D)s on board. One or other of them reported once a day, our time. In case you wonder whether they also called old class-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

mates just to chat, the answer is no. Time dilation meant that the timing was a major job of calculation and made contact difficult and tiring on both sides. Anyway it's strictly against the rules; a call at the wrong moment could be dangerously distracting.

After they landed it was simpler, of course, though still against the rules. Tina called me one night just as I was going to sleep.

Fred? Tina. Have you been to see Mother yet?

I was glad to be able to reply that I had.

Tina signed off without asking for details, which was just as well. I hadn't thought to call ahead. Mom was pleased to see me, all right; but she seemed to be entertaining half the local precinct to tea. I'd had brushes with more than one of them in the past. That, and the fact they all knew I was a telepath, made for a sticky atmosphere, and I didn't stay long.

Space training, the kind we got, wasn't hard. Someone spotted that and I found myself doing extra classes —planetology, some engineering, space-suit function and servicing; even a bit of navigation—not interstellar, just how to find your way round a solar system in an emergency. It was pretty tough, but Tsuling and a couple of others from Cougar Group were in the same class and I didn't mean to get left behind.

A couple of months after *Grimaldi* took off, a call came that turned everything upside down. It came through the C(L-D)s on *Fabricius*, orbiting Epsilon Eridani; they had found planets, and one of them, about two-thirds of an AU out, had signs of life. Signs of *terrestrial* life; bacteria and algae and a sort of amoeba. They believed they might be on the trail of one of the Generation Ships.

Way back before Disruption there was a sect which thought the duty of Man was to spread life to other stars. Whether they were mad or not, some of them were certainly very wealthy and they hired some damned good scientists. This was way before the Mass-Time Drive, of course; what they built were ion-drive ships which took ten years to reach a quarter the speed of light and as much to decelerate.

They were manned by a bunch of devoted loonies who planned to train their descendants to terraform planets. Their freezers were stocked with life-forms tailored for the various stages, starting with photosynthetic algae capable of transforming a no-oxygen atmosphere. The plan was to seed planets as they found them and come back in a hundred years or so to drop in the organisms for the next phase.

The official records got destroyed during the Disruption; all that was left was journalism, pretty vague about just where the ships intended to go.

Ten years back there had been rumors of a terraformed planet orbiting an unnamed yellow dwarf somewhere beyond Sirius; but it was never officially confirmed. Now *Fabricius* seemed to have chanced on a planet in the first stage of terraforming. However, she didn't carry a biologist qualified to say for certain that the algae and so on were derived from terrestrial types. Request for a couple of specialists and equipment for matching DNA and protein structure,

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

plus someone with ideas on terraforming, capable of studying the whole setup and maybe designing the next phase.

Herschel, one of the two oldest ships in the fleet, had been recently refitted to go to the Hyades in four months' time. It was planned to send her to join *Fabricius* ASAP, instead.

Tony dropped in to FarCry House about a week after the news broke. He was trying to keep a straight face, but a grin kept breaking through.

"I'm going on *Herschel,*" he said. "Assistant to the assistant comm officer, lowest of the low, but still—I'm going."

I congratulated him.

"Who's the captain?" I asked —mostly for something to say, it couldn't possibly concern me.

"Jangir." He pulled a slight face. "The Subcontinental group in the UN have been pressing for one of their nationals to get a command post. He stickles a bit for my taste—could get tiresome on a long voyage. Oh, well, the comm chief's a democratic type and I can manage a bit of saluting and salaaming if I have to."

Two days later I was told to report to the adjutant's office as soon as the morning classes finished.

She was a roly-poly little woman: the fat was reputed to hide a layer of woven carbon fibers underneath. Like everybody else I was afraid of her, and the fact that I had nothing special on my conscience didn't stop me feeling apprehensive. But the clerk in the anteroom reminded me that she was on leave, visiting a nephew in the L5 Station; we had an acting adjutant instead.

He turned out to be about my age, feeling his position; but after fixing me with a gimlet eye for about ten seconds he revealed that I was not there to answer for my sins, or even somebody else's.

"Cadet Porter," he said, "I have to ask you a hypothetical question, for the record. Supposing you were offered it, is there anything to prevent you from accepting an immediate space-going assignment?"

I swallowed a lot of air and choked on it. When I could I wheezed out "No, sir. Nothing."

"Good. *Herschel* is being commissioned ahead of plan and all trained C(L-D)s are already assigned. It has been suggested that some members of Cougar Group might finish their training in-service. This is only a possibility at present, but I am clearing up various administrative details in case it is actualized. You understand?"

"Yes, sir," I said.

"Good. Are you familiar with the financial provisions for service space-side?" I guess my face answered for me, because he went on immediately, "Briefly, in addition to salary, a bonus of twenty thousand credits is payable two weeks before takeoff. That's chiefly to allow personnel with dependents to make provision for them—mortgage payments, education fees, insurance and so on. No dependents are recorded on your P twenty-eight stroke A 10."

"I haven't any," I said.

"Well, you can invest it—the Finance department can provide advice if you need it. I'm still speaking hypothetically, you understand. However, if it is decided to assign cadets, those chosen may be required to report for duty

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

almost at once. If you have any affairs that need settling, better take care of them straight away. But remember this is not for discussion. We don't want to start a lot of rumors about something that may not happen after all."

I went up to my room and sat down.

I'd been a member of the Space Force for eight months, but I'd never really thought about the possibility of being shipped out. It didn't seem like something that could really happen—not to *me*. Anyway, the possibility had always been a comfortable distance off. A year, at least. Six months, at least. Four . . .

Maybe they'd decide not to use cadets. They could reassign three C(L-D)s from the contact teams and double up the rest. Easy enough to reschedule the hours at which the space-side C(L-D)s made contact. . . .

But there was supposed to be a contact on duty all the time for each ship, in case of an unscheduled emergency call. Also—something everybody knew but no one was supposed to mention—the Base teams contained all the C(L-D)s handicapped by age (there were two over sixty), physical problems (one spastic, one paraplegic in a wheel-chair), personality problems, or just lack of brains. Tony said rosters were arranged so that there was always at least one C(L-D) on duty who could be trusted in emergencies, but anyone whom the Base teams could spare was likely to be a liability in Space.

If any cadets were going to be assigned I was an obvious choice. I was the eldest by nine years, and physically the strongest, and among the brightest—well, I was one of the five getting extra training, at any rate.

Why the hell had I told the acting adjutant I was free to go? On the other hand what excuse could I have given for staying behind? No dependents, no obligations, no disabilities. Just that when I joined the Space Force it was meant to be temporary, a way out of trouble, nothing serious. They'd really love that.

Why the hell hadn't I gone AWOL a long time ago?—Because I'd never managed to come up with a plan that seemed half likely to work. I'd need a new identity, backed by entries in all the right computers. I knew where to go for it, but it would cost money; five thousand credits at least—

The memory hit me like a boxing glove; the Space Force would give me twenty thousand credits if they decided I was to go.

But would they just hand it over?—Why not? People went into the Space Force because they *wanted* to get to Space. I could be the only one in the whole outfit who didn't, much.

I could transfer the cash at once to an outside bank account—better start one with the pay I'd accumulated in the Base Savings Bank. Then as soon as my hired experts had established the new me . . . clear out. Move to another state, maybe another country. I'd have plenty of money left to make a new start.

Four days later we still hadn't been told whether cadets were to be assigned to *Herschel* or not.

I didn't even know for sure who had been told of the possibility. I rather thought Tsuling was keeping something to herself. Charity, well, under all the chatter she knew how to keep a secret. A couple of the other girls—maybe. The

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

rest of the class were still below the regulation age for going outside the Solar System.

We had been taken through computer simulations of *Herschel* in detail, and one afternoon the whole Group was taken on board. Still, that was more or less routine when a ship was available. As we were leaving we met Lynx Group coming in.

I couldn't keep my mind on classes. At night I couldn't get to sleep. I needed to know as soon as possible whether I was going to be assigned to *Herschel*, so that I could book an identicrafter in good time—according to the news there was a blitz on crime-stopping and that meant a good many people would be wanting to make a change at the same time as me.

Making pickup out of the blue, on someone who isn't calling, is not one of the skills included in the training of a C(L-D). It's uncouth, unethical, antisocial and strictly against the rules. We'd all tried it, of course, and swopped ideas and experience; but information you got that way would be useless, since you couldn't own to it; and all the non-C(L-D)s around Far Cry House had learned screening and kept it up automatically when there was something we weren't supposed to know.

But the acting adjutant was only temporary; there was a fair chance no-one had thought to teach him screening. On the fourth evening I decided to give it a try.

Basically you just sit and think about the person you want to make pickup on; but if they follow a regular routine there's a useful short cut. If you know just when they do some particular job, and hold it in your mind a few minutes beforehand, when *they* start to think about it that can act as a way into their mental continuum. Then if you keep just the right kind of passive awareness going you can stay with them for a while.

What you get out of it depends on what happens to be on their mind at the time. Usually it's nothing much.

I was lucky. I made pickup on the A.A. as he locked up his office files, sharp at 1730 hours. He hadn't a trace of a screen. He thought about the stiffness of the lock, and the adjutant's filing system; and then about the things he had to do first tomorrow. One was to confirm the timing of a meeting to be held at Space Gate the day after, to discuss the selection of *Herschel*'s C(L-D)s.

He was a steady, methodical thinker, the easiest kind to stay with. I learned quite a lot about the way one Regular officer felt about C(L-D)s (not that much different from cleaners and other non-Regular personnel) and Commander Rivers *(odd chap, no ambition, all that clout and he won't make use of it)*. Then he switched suddenly to the girl he was having dinner with and I was startled into losing contact. I wouldn't have taken him for that sort of man.

One important thing I had picked up; he was going to attend the meeting tomorrow, to take notes *(clerk's job, but may turn out sensitive; touchy, Jangir; doesn't care for Rivers at all.)*

I cried off from an appointment to let Bernie chuck me around, and at 1400 hours I was lying on my bed, quietly thinking about the A.A. unlocking his briefcase at the meeting.

Didn't work. Maybe he'd opened it

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

before I tried to tune in. After ten minutes I started to think about making notes of the discussion.

What I got was a startled decision *not* to note down what had just been said. After which contact broke.

No point in getting annoyed. I just lay there and thought about the A.A. Listening, making notes. Nothing. Then I tried to think *like* him; *Outspoken fellow, Jangir; what's Rivers going to think of that, I wonder . . .*

What actually made the link was my own name. I suppose I made pickup on the A.A. hearing it; or it might have been one of the others at the meeting—

. . . this fellow Porter. After that episode I made a few enquiries. Got a criminal record—

No. He has not. I checked

(Jangir never likes being contradicted—)

He's an associate of criminals, then. Unsavory fellow. His sister knew, or why did she never speak to him while they were both at your place? No, I don't want him aboard. How about the big ox who was in the judo quarter-finals? Nothing against him. Could be useful for hauling equipment over the surface, at any rate.

I'd never quite understood the bit about emotional shocks wiping out telepathy; but I lost contact this time and for a minute or two there was a queer blank feeling inside my head. Then I started to get angry.

I'm not a criminal. I may be on the run but that doesn't make me a crook. It's the crooks I'm running from, well, people who were said to be crooks; I never saw them do anything criminal myself. Well, not exactly. Some of the things I delivered for The Man may have been not exactly kosher, but I never saw what they were. That money I handed over to the wrong man—I suppose that was a payoff, but—

It hit me quite suddenly; that business was a setup. The Man wanted something on me; maybe so he could get at Tina, maybe so I'd have to do what I was told over other things.

Damn it, I ought to have seen that at the time. It had happened before. The first job I ever had. I couldn't hold it unless I belonged to the Union and I hadn't gotten the money for the fee. The rep offered a loan, to be paid off by deductions from my salary. He increased it so that I could pay a month in advance for accomodation and get something smart to wear. A thousand credits, in the end, at 5 percent per annum. I signed the papers gratefully and never gave it another thought.

Five years later he sprung the trap. I hadn't signed the form authorizing deductions from my salary. Compound interest was piling up. I owed him five thousand credits now.

I screamed—not just to him but to the boss. The paper with my signature was produced. Interest at 50 percent per annum. I couldn't see where he'd altered it.

He suggested a way in which I could pay it off. Some friends of his wanted a few driving jobs done, after hours. Five hundred credits a go.

The boss urged me to take it. The creditor had a nasty temper and some nasty friends. I didn't want the loan piling up any further, did I?

So he was in on it, too. I didn't know what to do. If I took part in a robbery—it

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

had to be that—they'd make sure to have evidence of it and I'd never be in the clear again. . . .

I went to Mom in the end. I didn't know where to turn. She got the money, somehow. . . .

A queer feeling came over me, as though the inside of my head had gone cold. I knew bloody well how she got it. She sold the house, the one Tina's father rebuilt for her, Tina's home, and moved to an Accomodation Unit in Rockwell Deep.

No wonder Tina despised me.

An unsavory fellow . . . Jangir was *right*. Unsavory, and weak, and *stupid*. I should have noticed that the deductions weren't being made from my pay. I should have gone to the Union. I should have gone to the police. You can get real protection in Rockwell Deep—well, the upper three Levels, anyway. I should have taken my lumps if I couldn't do any better; I should *not* have gone to Mom.

If I'd got that twenty thousand credits I could have paid her back.

I hadn't even thought of it. All my plans were for running out. That's the kind of fellow I was. Unsavory. Right.

It wasn't the first time I'd had an attack of conscience. Mostly by morning my mind had rearranged things so I found them forgivable. Not this time, though. I woke remembering I was a louse and went out to try and run away from myself.

I couldn't. I made good time, though. Come to think of it, my *physique* had improved since I joined the Space Force. Time was I plodded along behind the Sergeant with my ribs heaving; now I left him about a quarter of a mile behind. *Some* things could be changed. . . .

I was still worrying that thought when the Sergeant trotted up.

"Something wrong?" he said.

"Just thinking, Sergeant. . . . You know that proverb about the leopard and the spots?"

He gave me a long, thoughtful look. "I heard it, yes. I guess it's true about leopards, but there *are* animals born with markings that alter as they grow."

The postings to *Herschel* were announced that day: Bernie, Tsuling, and a man from the Epsilon Eridani contact team, called Smith.

Bernie was as near excited as he ever got, but he was puzzled, too.

"You've got more training than me," he said. "Why didn't they pick you?"

I shrugged. "Maybe they're saving me up."

Nobody else asked. I kept a tight screen, just in case.

Herschel took off ten days later and reports started to appear on the bulletin board beside those from *Grimaldi* and *Fabricius* and the ships in the Hyades. The routine of training went on. After a couple of months Charity, I, and two others who'd passed their eighteenth birthdays were sent to the Moon for training in vacuum and low gee.

We survived, in spite of a couple of hairy moments. When I got back I did something I'd been working up to ever since *Herschel* left. I went to see the finance officer and asked about my back pay.

I'd got my sums right. It came to just

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

over five thousand credits. I drew it out and went to see Mom.

This time I called in advance, and she was alone. She tried to tell me I should hold some back in case I needed it, but I wasn't having any. I was living without expenses and the money would go on piling up. I tried to apologize for being such a rotten son, but she shut me up. I invented a couple of messages from Tina and kissed her goodbye.

I had walked half the way from her unit to the nearest lift when I felt people behind me. Not in time to do anything. They stepped forward on either side and boxed me in.

"Fred Porter," said the one on my right. Not a question.

"Police," said the one on the left.

I stopped. They grabbed my elbows and got me going again.

"What's the idea?" I protested. "Are you arresting me?"

"Nope," said the one on the right.

"Just a few questions," said his pal.

"If we arrest people we have to read them their rights, don't we?"

"But when it's just a few questions, well—" The left-hand joker shrugged.

They turned abruptly into a narrow gap in the street-face. I didn't remember it and as soon as we were inside it closed. A light snapped on. I was marched half a dozen steps, then propelled into a miniature cul-de-sac which turned out to be an elevator. A door slammed shut and we shot down.

I'd been told that the police had ways of getting around Rockwell Deep that weren't available to ordinary citizens; presumably this was one. I tried to estimate how fast we were falling—quicker than the ordinary lift, for sure—and decided that we must have dropped two Levels, not one.

So we were coming out into Fourth Level. I felt a prickle of uneasiness. That used to be the high-priced, high-society part of Rockwell Deep; so when it became fashionable to move aboveground it was the part that emptied first. Whereupon it was colonized by two classes; down-and-outs of all kinds, and crooks. On the other three Levels there was a system of camera surveillance in all streets that made violence almost impossible to get away with. If the central computer didn't spot it immediately, the evidence could be retrieved any time during the next forty-eight hours and used in court. But in Fourth you could hire a down-and-out to break cameras at Cr5 a go. His face would be on record and he'd be sure of a month in jail, but meanwhile you could be sure of at least half an hour when your activities wouldn't go on record.

That left it up to the cops. Cops on Fourth Level were remnants, hanging on for a pension, or dregs who wouldn't be accepted anywhere else. These two weren't old enough to be in the first bracket.

The elevator hit bottom and one of my captors opened the door. The other one pushed me out. A slab of rock slid aside and they maneuvered me into the street.

I swung round. If these goons were working for themselves, or for Fratricelli, my best chance was to get a fracas on record. If the cameras were out of action—well, I wouldn't be much worse off. I might even—

The man on my left didn't know judo. He went head over heels nicely. I was

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

just starting to turn when I heard a faint buzzing noise and something hit me a vast, impalpable, paralyzing blow.

I came round with pins and needles all over and half a dozen muscular twitches. I'd never copped a police stunner before, but I'd heard the symptoms described.

I was lolling in a hard chair with a strap to keep me in place. Bright light filtered through my eyelids. There was a smell of air-freshener and irradiated dust.

"Come on, Porter. We know you're awake."

I opened my eyes.

Left and Right, Jester and Joker, whatever they ought to be called, were standing on either side of me. There was a metal desk in front. Not much else to look at; walls faced with scuffed plastic, a wall-screen with a bad case of the flickers. Total floor space ten feet by ten.

Right and Left looked at one another.

"OK," said Right irritably, "what are you waiting for? Get the A.D.A."

Left departed.

"You used to work for Fratricelli," said Right.

I found the buckle of the strap and opened it.

"If you can call it work," Right sneered. "What did they call you—Third Assistant Deputy to the Secretary's Secretary?"

Funny. I could remember being proud when I got that job.

"Oh, well, work's where you find it," said Right philosophically. He seemed to be trying to work the seesaw routine—nice cop, nasty cop—all by himself, and finding it heavy going.

He was spared the need for a follow-up. A superior class of interrogator strolled in, sat down behind the desk and dismissed him with a flick of an eyebrow.

If this was the assistant district attorney they were dressing snappier these days.

"Not a good idea," he said casually, "resisting the police."

I said, "They could have been Fratricelli's goons for all I knew."

He looked at me thoughtfully. "I gather you parted from Fratricelli on bad terms."

It wasn't a question, so I didn't answer it.

He said "Fratricelli was arrested yesterday on a number of charges. Several of his associates have been brought in and the rest are under investigation. You don't have to be afraid of him any longer."

I said, "Being a bit naive, aren't you? He hasn't been tried yet."

"He will be, very shortly. We have enough evidence to get him compulsory reform." He pursed his lips and added "Of course, we could always do with more."

"Don't look at me," I said. "I was PA to one of his secretaries, that's all. If there was anything illegal going on they never let me near it, Not to know it, at all events."

He felt over the desk, which was bare; then got a scriber from his pocket to twiddle. "However," he said, "you have means of collecting information that were not known to him at the time."

So that was it.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

"If you mean telepathy," I said baldly, "I didn't know that at the time either. And if I had known I'd have taken damned good care not to pick up any information I wasn't supposed to have."

"That would have been sensible," he said, "at the time, no doubt. But I understand that a telepath sometimes picks up knowledge inadvertently, so to speak. Sign this, will you?"

He handed me a pale green form.

I read it and handed it back. "No."

He looked at me reproachfully. "It is a citizen's duty to give any information they have, regarding criminal activities—"

"I'm not consenting to be hypnotized," I said. "It could destroy my telepathy, for all I know. If you want that you'll have to consult my CO. But anyway I'd be aware of it if I'd had any seepage from The Man. I didn't. So if that's what you wanted to kow—"

"Stay where you are," he said sharply, then modulated back to the conversational level. "So the accidental acquisition of information is 'seepage.' It happens often enough to have a technical term."

"It happens," I said noncommittally. "We learn to shield against it."

"What!" He was startled and displeased.

"Getting someone else's thoughts mixed up with your own can be a damned nuisance," I told him. "That's probably why telepaths are so rare. Most people learn to shield right from the start."

"But you don't—er—shield all the time?" He sounded quite worried about it. "That would make your work impossible, of course."

You *can* keep up a shield against general seepage while making pickup on a call, but he seemed happy with his conclusion and all I wanted was to get away.

"So," he went on hopefully "if you were to come into contact with Fratricelli again—"

"I'd set up a shield and keep it," I said firmly. "C(L-D)s are strictly forbidden to spy."

He straightened indignantly. "Obtaining information in the interests of justice is not spying!"

"Making pickup on civilians on purpose *is*. Look, you've got the wrong idea. C(L-D)'s not about gathering information, it's about *transmitting* it—"

Maybe it was that last sentence—or the thought behind it—that did the trick.

C(L-D) . . . Mayday. C(L-D) . . . Mayday. Bare foot. . . . Lossoch. C(L-D) . . .

Bernie. What's wrong? . . . Man opening a door. Porter. Fred . . . State position."

Fred . . . Mayday. Bandage.

That was C(L-D) for "hurt." Bernie—hell, he was on *Herschel*! And *Herschel*, according to the bulletin board, reached the Epsilon Eridani system two weeks ago.

Bernie. Bare foot. Lossoch. State position. Query on ship. Query in space. Query on planet.

I was vaguely aware of a disturbance. Something was shaking my shoulder. I brushed it away.

Bernie. State position—

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Planet.

How the hell—Never mind. I tried to think of what to ask next.

Bernie. Are you alone? Query, alone. Alone. Query one spaceship man. Two twins men. Three oranges men. State. . . . are you alone?"

Spaceship . . . broken.

Oh, hell, what did that mean? Why did the counting system say "one spaceship"? "One apple" would transmit just as well and wouldn't involve this kind of confusion.

Bernie. Query alone. Query people with you.

Blurr

Goddamit, why was he calling *me?* There were two other C(L-D)s with the expedition—Tsuling and . . . and . . . Smith. Why was he reduced to calling into the blue? How badly was he hurt? Was there really a broken spaceship involved—

Fred, this is Tony. Fred. Man opening a door, this is Tony—Shining horse (There were objectified signals for each member of the crew, not just the C(L-D)s.) *Fred, the shuttle is crashed and Bernie is hurt. Radio's busted. Call Smith on Herschel and tell him. Call Smith on Herschel and tell him the shuttle is crashed and Bernie is hurt. These are the coordinates—*

"Give me a scriber!" I yelled. "Give me a scriber, quick!"

I was trying to memorize the first half of the sequence while writing the rest. It didn't work. Fortunately Tony repeated it, twice. I looked down at what I'd written—or rather scratched into a shiny surface. The desk. I was at a police station on Fourth Level. Never mind. Irrelevant.

Smith. Man hammering iron. Porter. Man opening a door. Mayday message received from Lossoch. Bare foot. Acknowledge.

I went on repeating it for five minutes. No acknowledgment. I transmitted the coordinates twice in case the problem was with my reception rather than Smith's. Then I tried Tsuling. No reply.

I tried to contact Bernie again. Blank. I even tried to call Tony, though he had never received anything I sent him during practice.

I tried Smith again. Nothing.

Who was on the contact team for *Herschel*? And which of them would be on duty now? Carter, Protopopov and . . . Protopopov was the one with sense, anyway.

Protopopov. Amoeba goodbye. Porter. Man opening a door.

Blurr. Query—Protopopov. Porter. Query—

Urgent message received from Lossoch. Bare foot.

Let's have it. Repeat.

I heaved a sigh of relief.

Shuttle crashed at—I gave the co-ordinates carefully, twice. *Lossoch hurt—sorry, bandage. Message mostly from Guiaccini. Shining horse. Assistant comm officer. Called Smith. Man hammering iron. No reply. Also called Tsuling. Man with dog chasing fox. No reply.*

Porter. Protopopov. Message received.

That was all. He'd be trying to call Smith himself—might well do better than I had even if Smith was asleep—

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I came slowly back to my surroundings.

I was on my feet with both hands resting on a smooth surface—a desk. There was a man behind it, standing well back behind the chair—a man in a white coat with *MO* on the pocket. A chair lay on its side behind me.

I said "Where is this?" before I remembered. . . . "What's happened to the man who was questioning me?"

"He bumped his head when you threw him against the wall." The MO was eying me warily.

I felt suddenly very tired. I picked the chair up and sat on it.

"Sorry," I said. "Did he try to interrupt?"

"You don't remember?"

"Somebody grabbed my shoulder . . . I was concentrating."

Was there anything else I ought to do? Call anyone? No—might interrupt.

I wondered what sort of penalty you got for throwing assistant DAs against the wall.

Fred. Charity. Query whereabouts.

I sat up sharply and the MO, who had approached when I wasn't looking, jumped back.

Charity. Fred. Rockwell Deep. Fourth Level—

"Where is this?" I asked the MO "I mean, what precinct?"

"Oh. Er . . . Fourth Level East."

I relayed it.

We know that much. Whereabouts in the precinct? Oh—never mind. Cancel.

"Was that . . . er . . ."

"Making pickup," I said absently, wondering what was going on.

"You were actually receiving a message telepathically? It doesn't always cause a seizure, then?

"What seizure? I got an urgent call unexpectedly, that's all."

He looked sceptical and I started to worry, but then the door slammed back in its groove and the room got full of people, with Charity in front.

She was in uniform—charcoal-grey—and looking fiercely serious, which meant she was trying not to giggle. Behind her was the law officer from FarCry House. Behind them was a heavyweight cop with captain's insignia who was trying to get to the front.

"Where the hell's Streatham?" he bellowed. "What does he think he's doing, kidnapping the Space Force in *my* precinct? Where's he gone?"

It took the law officer forty minutes to shake me loose, largely because the captain kept bellowing questions and not listening to the answers anyone tried to give. Assistant District Attorney Streatham had demanded an ambulance and left in it before the ruckus began.

As we were walking along the passage from the interview room a door opened. A cop stepped out and said something to the captain. I glanced past him—no conscious reason—and saw The Man. He was sitting very upright and disdainful, immaculately dressed as usual, with what looked like a lawyer on either side. The captain bellowed, and the door slid to.

The law officer sat beside the driver and Charity and I got into the back of the floater. As we took off I asked her "Is there any news about Bernie Lossoch yet?"

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

She said "News? He's on *Herschel*! What kind of news?"

I said "Then how did you know where I was?"

"Security," said Charity. "Except they didn't know what room you'd be in. That's why they sent me. The captain found out from one of his men, though, when we told him you were here. What's Lossoch got to do with it?"

Security. So they'd been keeping tabs on me. In case I tried to abscond?

Charity dug me in the ribs. "What about Lossoch?"

I had just started to tell her when the radio beeped and the law officer put the headset on. After a moment he spoke to the driver; "New instructions. Drive direct to the Gate." Then to us; "The commander wants to see you, Porter. Straight away."

I wasn't dressed to be seen by the commander. The civvies I had worn to go and see Mom had been respectable enough, but subsequent events had spoiled their shape and texture and there was actually a small but conspicuous rent over one knee. Also the housekeeping at Precinct Four East was lousy; the dust-collector in that interview room had been allowed to saturate and dust was actually lying around in there; some of it had got transferred to my face.

Charity pointed this out to me. I was almost asleep where I sat; Charity prodded me into being properly worried about my appearance. She lent me a couple of tissues and acted as talking mirror while I did my best to clean up. As I was trying to locate the last smudge—

Fred. Tony here. Shuttle just set down. Good work. I wasn't sure you could do it. This is Smith's sleep period and Tsuling's gone snowblind.

I'd guessed that, but it was still a shock. "Snowblind" is C(L-D) for telepathy going off. What the hell was happening to C(L-D)s on that ship?

This wasn't Bernie's fault, whatever the captain says. He should never have been on this trip. The shuttle had to land five miles from the objective—the biologists wanted to study a swamp. Bernie came along to carry equipment. They sent him back for another load. There was an earthquake and the shuttle started to topple. Would have righted itself, but he tried to shove it back by force. Ruptured himself and broke something in the attitude controls. There was another quake and the thing fell over and trapped his foot—

"*Porter!* Wake up, will you? Get out of the floater!"

The contact broke.

It's a shock when it happens like that. I'd been told so and now I discovered it was true. The floater was stationary in front of the Command Building at Space Gate. Standing by it was a regular lieutenant who could have modeled for a recruiting poster. He took me over and I was whisked up in an elevator right to the top.

I didn't know there was a penthouse on top of the Command Building; from below it's hidden by the wall round the roof garden. I didn't know about that, either, until we stepped into it from the elevator. Only the lower three feet of the wall was solid; above that it was a sort of colonnade through which you

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

could see for about fifty miles in all directions.

I didn't get to look for more than a moment. Commander Rivers stepped out of an elevator on the far side. The lieutenant took a firm grip on my arm and propelled me towards the penthouse. At the patio doors he let the commander go first; we followed on his heels.

The lieutenant halted a couple of steps inside in order to salute. I halted a step sooner, out of sheer astonishment. Facing the door, in a canvas reclining chair, was the Admiral of Space, Rui TeKawa himself.

Anyone in the world would have recognized him, though nobody knew what he really looked like. His face was tattooed, copying photographs six hundred years old, of a Maori chief. Some journalist said that he wore a permanent mask of wise ferocity. Right.

He answered the salute with a slight wave, which must have been a signal to the lieutenant to take himself off, because he did.

Rivers said "Cadet Porter. Tell us about the pickups you made on *Herschel*'s crew, this afternoon."

I tried to hold back a sigh of relief. Of course if I'd had any sense I'd have realized that was why I was wanted; but the afternoon seemed to have knocked most of the sense out of me and I'd got it into my head that Rivers had somehow made pickup on my plan to go AWOL. . . . I pulled myself together and reported the series of signals, as near word for word as I could.

At the end the admiral said "So it was the Assistant Comm Officer, Guiaccini, who actually gave you the coordinates of the crash?"

"Yessir. Bernie—C(L-D) Lossoch faded out. . . ." I was just going to ask if they had any news of Bernie when I remembered who I was talking to.

Rivers said quietly, "Protopopov managed to wake Smith—it was his sleep-period—and a second shuttle was dispatched to pick up the group on the planet. Lossoch was badly injured but should recover. I don't yet know how the crash occurred or what Lossoch was doing on an expedition planetside. He's had no training in potentially hazardous environments."

So I was one up on the Commander. I opened my mouth to indicate this, and realized it might not be a good idea.

The admiral said "Yes? . . . What else did Ensign Guiaccini have to say? . . . Just the facts."

I edited Tony's remarks as well as I could.

At the end he said "Thank you. It will be a long time before I get the official reports. I do not intend to burden the C(L-D)s on *Herschel* with demands for details. Now tell me why, when you made pickup, you were in a police precinct."

Oh, shit. . . . I tried to pull my thoughts into shape. "I wasn't under arrest, sir. One time I worked for Fratricelli—"

"Yes, I know."

"An assistant DA got the idea that I might have picked up information about illegal operations—not direct, but through telepathy. He wanted me to be questioned under hypnosis. That's what he said. I found out later Fratricelli was *there*, in the next room. My guess is the

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

DA wanted me to try and make pickup on him while he was being questioned—to see what he thought about that he didn't say."

"Your guess is very probably right," said the admiral. Some of the tattooed spirals on his forehead had changed shape—a frown, I suppose. "The suggestion has been made repeatedly that C(L-D)s should assist the police in that way. What do you think about it?"

"I think it's—er—ridiculous, sir."

"Why?"

It just struck me that way . . . no, that wouldn't do. . . . I was worn out, in no state to think. . . . "Well, firstly, sir, if the big boys—if, er, organized criminals thought C(L-D)s were going to give evidence against them—" I lost the thread for a moment as I thought of something else— "if they thought that it'd be open season on C(L-D)s. And anyway I don't think it would be evidence—information obtained telepathically, I mean. I suppose it could be a help in finding evidence—knowing what to look for—" Now I was arguing on the wrong side. I ran down.

"There is another reason, equally important. Anything that encourages the idea of telepathy as a source of information will increase distrust of C(L-D)s. This is widespread, I am sorry to say—not only among the general public, but in the Service itself. C(L-D)s are already feared as possible spies; there must be no evidence that such fears are based on reality. You understand?"

"Yessir." It was a great honor—chatting with the Head of the Space Service in his private quarters. Being asked for my opinion—me, Fred Porter. . . . I wished fervently that he would let me go.

"Good. Your recruit does you credit, Commander. Dismissed."

The entrance to the elevator was straight ahead. I don't think I could have found it on my own. I followed Rivers inside and leaned against the wall. Then I remembered I was In The Presence Of A Superior Officer and straightened up.

"Don't bother," he said. "No Regulars here."

I risked a faint grin.

"The Admiral believes in the passing of ordeals as a qualification for manhood," said Rivers. "You got through that one quite well. Kept your head. You seem to have done so this afternoon as well."

I wondered whether he knew about the ADA getting thrown at the wall.

"It was just as well that Security has been keeping an eye on you whenever you left the compound," said Rivers thoughtfully. "They thought Fratricelli might try something. They arranged for the surveillance system in Rockwell Deep to take note of your movements. Otherwise it might have taken quite a while to find out that you were in the ADA's clutches."

So *that* was why— They *didn't* suspect I had planned to go AWOL. I was filled with relief.

The lift stopped. I followed the Commander to the parking lot.

He said casually, "Are you still planning to pull out?"

"Why—what—how—" I was spluttering. I managed to stop that, but I couldn't come up with anything better.

"Not seepage," said Rivers. "Sev-

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

eral of the psychologists who interviewed you warned me that you were thinking on those lines. They said it was part of your pattern—to look for temporary solutions to immediate problems rather than anything longer-term."

"Yea," I said. "All right, I used to. But not any longer."

I realized for the first time that I didn't want to pull out. I *belonged* to C(L-D). I wanted to stay that way.

Another thought hit me in the belly.

"You didn't have to worry, did you?" I said. "You could tell Security to leave me loose. I couldn't run away. Maybe I couldn't even really *want* to."

"Why not?"

"Because I've been conditioned against it." I was used to the idea that I'd been conditioned to behave myself; it was reassuring. This, I hated.

"Where did you get that idea?" The commander sounded astonished. "We don't use conditioning—except for people who are likely to be space-sick."

"That's a lie," I said. "Everyone knows it's used to get rid of antisocial behavior trends and—and dangerous habits."

"Not in the Space Force," said Rivers. "Not in C(L-D). If any of our people have habits that might be dangerous in Space we keep them on the ground. As for antisocial behavior . . ." He paused thoughthfully. "We haven't come across any really criminal telepaths. I'd have to think very carefully if we did. . . . Who is 'everyone'?"

Who the hell *had* told me the Space Force would condition me? Whoever it was had been convinced, all right. They'd convinced *me*. So why—

I forgot my company, and swore.

"Tina!" I said. "It was that sister of mine. . . . After you told me I was C(L-D). She was *thinking* it—real hard. In the back of the floater."

"Oh, yes," said Rivers. "I remember she seemed a bit disturbed. Probably she found the idea soothing."

I realized that so had I. I never *wanted* to go through life making a mess of things. The idea of being conditioned against it was a sort of prop.

"You mean," I said wonderingly. "I've stayed out of trouble for ten months, all on my own?"

Well, not on my own. I'd had a lot of people behind me. Tony, and Tsuling, and Sergeant Krantz . . . and Bernie, and Charity . . . and Rivers, and Nakeda—yes, and even Tina, and Mom . . .

But I'd done it. I'd proved I didn't *have* to make a mess of things.

There in the parking lot I stood in my shoes, and I wondered. ■

(EDITOR'S NOTE: This is a companion piece to "Interference," which appeared in our March 1988 issue.)

MOVING? If you want your subscription to *Analog* to keep up with you, send both your old address and your new one (and the ZIP codes for both, please!) to our subscription department: Box 7061, Red Oak, Iowa 51566.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the reference library

By Tom Easton

Chicago Red, R. M. Meluch, ROC, $4.95, 320 pp.
Singularities, W. T. Quick, ROC, $4.50, 286 pp.
Fire on the Border, Kevin O'Donnell, Jr., ROC, $4.50, 368 pp.
The Colloghi Conspiracy, Douglas Hill, Gollancz (available from Trafalgar Square/David & Charles, North Pomfret, VT 05053), $? (hb), 238 pp.
Pandora by Holly Hollander, Gene Wolfe, TOR, $17.95, 200 pp.
Dead Voices, Rick Hautala, Warner, $?, 406 pp.
Pulphouse No. 8 (Summer 1990), Kristine Kathryn Rusch, ed., Pulphouse Publishing (Box 1227, Eugene, OR 97440), $20 (hb trade ed.), 243 pp.
Across the Wounded Galaxies, Larry McCaffery, ed., University of Illinois Press (54 East Gregory Drive, Champaign, IL 61820), $29.95, 267 pp.
The Magic Flute, Books 1 & 2, P. Craig Russell, Eclipse Books (P. O. Box 1099, Forestville, CA 95436), $4.95 each, 44 pp. each.
Orbit Graphic Science Fiction, No. 1, Letitia Glozer, ed., Eclipse Books (P.O. Box 1099, Forestville, CA 95436), $4.95, 46 pp.
Books on Disk

R. M. Meluch has earned considerable praise, here and elsewhere, for her previous novels (such as *War Birds*). It should thus surprise no one that she has done a beautifully satisfying job with her latest, **Chicago Red.**

The tale's premise is that climatic change and other factors will bring down civilization as we know it today. Democracy will be extinct. In due time, America will be ruled by a monarchy that bans literacy, outlaws books from the Beforetime, and keeps the common people in ignorant poverty. The pattern is that of a pre-Magna Carta England, a pre-Revolution France, a Czarist Russia, in all of which wealth, luxury, and comfort were the monopoly of a nobility that ruthlessly exploited the peasantry.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Not surprisingly, the peasantry is not all that pleased with its situation. From it arise rebels such as Henry Ivers, who write pamphlets, compose songs that stir the blood (and one of which gives the book its title), and are hung. Ivers has a follower, young Chris-John Stanton, who hides beneath the scaffold, cuts the body down, and hides it. For his act of heroism, he gains the name Chicago Red and becomes the leader of a bloody revolution that falters when King Edward II retreats to the Isle of Maine and lets a more humane individual take the reins of government and, because he eases the worst abuses, weaken the grievances that drive the revolution.

The events that in the end bring the monarchy down owe more to fluke than to rebel design, but that too is the way history happens. It is one of those many things ruled by the Gray God Murphy who, if he seems to favor one side of an issue now will surely favor the other tomorrow. It is also a thing of people, and Meluch knows this as well as anyone could ask. Meluch uses very few stock characters, and when she does she often cuts them of cloth—even of brocade—not cardboard.

This is even true for the nobles, few of whom are monolithic in their villainy. There is an archbishop who plays Robin Hood and sympathizes with the rebels. There is Marion Martel, daughter of the general, who is careless of her rank but cares for a prince, loves the archbishop, and is crippled by a bullet until . . . there is Tow, the king's own assassin, child of anarchy and demon of perversion, who finds that he is after all capable of love, and for Chicago Red's naive brother at that. The book's main characters are human beings of considerable and realistic complexity, and the reader finds himself or herself identifying with whichever one of them—even the nastiest—is on stage at the moment.

Meluch's high accomplishment is not lessened by the amount of romance and pathos she has mixed into her plot. True, the tale may strike some readers as a little more sentimental than SF tends to be, but the sentiment is an integral part of the whole. Meluch has done a grand job of imagining a possible future and the people who must inhabit it.

In *Dreams of Flesh and Sand* and *Dreams of Gods and Men,* W. T. Quick gave us a form of cyberspace, an inventor (Norton) who moved into his "meat" computers, a Japanese industrialist (Nakamura) who wanted to rule the world, computer whizzes Berg and Calley, a god (Arius) emergent from the machine, intrigue and violence, Earth-Moon war, possible aliens, and more. **Singularities** takes the tale the next step. Nakamura's plots near fruition as war rages between nations and the new church whose symbol combines cross and dollar, as governments fall beneath his sway, as corporate giants bow before him. Only Luna resists, though it is weakened by a tidal influx of refugees (perhaps including Nakamura's covert agents) and by the unfortunate fact that Luna's electronic artificial intelligence, Levin, is not responding to inputs. At the same time, a bodiless Berg is lost in Levin's cyperspace. Calley and her hardware-whiz buddy, Ozzie, are also lost in cyberspace, though they have bodies waiting in nutrient tanks for their return.

Nakamura's plots move ruthlessly, nastily forward in the real world, but the real action is in cyberspace, where Calley, Ozzie, Berg, and Levin must do battle against Arius for the fate of humanity. Unfortunately, the action does

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

get a little confusing; people need familiar surroundings, and when the characters stuck in cyberspace create a world that mimics Nakamura's, the boundaries seem to blur just a bit (or wasn't I paying attention closely enough?). The reader's head spins even more at the end, when Quick throws too many fresh novelties into the pot. The characters suddenly become avatars out of Hindu myth, Vernor Vinge's Singularity (when the curve of human progress goes off the chart) makes a cameo appearance, and the aliens . . . they remain possibilities, perhaps to leave room for another book in the series.

Lest my comments about confusion and head-spinning make you think I'm panning the book, let me reassure you: The end result is not total bafflement but breathlessness, very much of the sort you have not felt often enough since you discovered SF as a youngster. In other words, you'll enjoy the series.

To set up **Fire on the Border,** Kevin O'Donnell, Jr., tells us that when human civilization had expanded to cover some 1,200 worlds under the pseudo-corporate vigil of the Terran Association, humans met their first aliens, the Wayholder. As soon as the two species figured out how to talk to each other, the Wayholder said, "Hi. We are your defense. Stay out of our hair. Bye." And that was the end of contact until the Wayholder suddenly, without warning, attacked New Napa, a world of Octant Sagittarius. Over commander Kajiwara Hiroshi led the defense and successfully destroyed the first waves of invaders but was then swamped. New Napa's populace was slaughtered. Kajiwara was relieved of command and forbidden, despite his samurai dedication to honor, to commit suicide. He was also told that the Wayholder had explained themselves: They are fighting a war against voracious destroyers, their recruits need training, and the worlds of humanity *will* be the training grounds. Resistance will mean immediate obliteration of the Terran Association and humanity.

What would you do at this point? If you're the Association's biggest cheese, intent on preserving the status quo, you stall. You measure the Wayholder strength, estimate how long humanity will need to build up its muscles to win the fight, and tell the supremely competent Kajiwara to go get a clone started and record his mind so the best will be available when needed. Then you put your hero on ice. If you're Kajiwara, you go nuts. If you are those whose families and worlds are at stake, you say the hell with sitting on your hands while waiting for future guarantees. You want to do whatever you can right now. You therefore organize the Sagittarian Guard and do your damnedest to accumulate material and defend your worlds.

The Wayholder, of course, get annoyed at the Guard and tell the Association either to stomp the rowdies or to stand aside while they do it. The Association assigns Kajiwara's clone to do the stomping. But the Guard is sneaky. It knows how to beat Wayholders. It has the sympathy of many loyal troops. And when the clone goes over to the Guard . . .

I'll leave it to you to guess what happens next. Rest assured that O'Donnell's issues will rivet you, his people will engage you (although the love interest is not convincing), and his technology—featuring fleetships that are huge clusters of modules and submodules that can fly off to fight independently—will enchant you for its scale and the tactics it permits.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Yah, it's awash with blood. It's militaristic, politically simplistic, and far too derivative of the human-supremacy school of science fiction. Key tactics only work because the Wayholder are idiots. But the stakes are truly enormous, and the scale and sweep of the yarn are as wondrous as any reader could wish. You'll enjoy it. I did.

A familiar figure in SF is the stainless steel knave, the hero to whom morals and ethics refuse to stick, the adventurer who is out first and foremost for his own gain but winds up doing good willy nilly and gaining (when he does) almost despite his own best efforts. Douglas Hill's **The Colloghi Conspiracy** introduces the latest entry for the list: interstellar courier Del Curb, as greedy, self-centered, and cowardly as any hero you've ever met. He also has execrable taste in clothing. Yet he does have both a better nature and a rather more competent sidekick, his ship's computer, Posi (a Polyfunctional Organizational and Service Intelloid). There are also a good many attempts to be funny, though I suspect Hill's humor may have gone over better in England.

As the story opens, Del is learning that Pulvidon, a past enemy and a member of the Famlio (green grow the poppies, oh),[1] is after his ass. He is delighted when he is asked to travel to the asteroid that is the Museum of Old Earth, there to pick up an antique suspended animation pod, complete with presumably still viable contents, and haul it to the world of Colloghi, where it will be used as promotional gimmick for Hiatus, a more modern suspended animation vacation operation. Once there, he finds colonists who abuse local subsentients who in turn show how nonsub they are when Del proves to be a humane human, the sexiest newscaster in the galaxy, a suspiciously secret operation, and Pulvidon. It's a plot, a trap. Worse yet, it's a conspiracy, the Colloghi conspiracy, and what Pulvidon wants to do to Del is only the least, the most trivial, of the evils that are afoot in the bowels of the mountain.

You say you don't need much more? OK.

Gene Wolfe's **Pandora by Holly Hollander** is labelled "Fantasy" but bears nary a trace of that genre as we usually define it. Yet Wolfe is Wolfe, one of the blossoms in the garden that is modern SF, and that is reason enough to review the book. If you insist on a more textual fantasy or SF connection, please consider that all fiction is in a sense fantasy. As certainly, so is any tale that pretends to be told by a teenaged girl when the true author, except for his constant cherubic smile and the lack of a cigar, could easily be mistaken for a Chicago alderman. Just as certainly, so is any tale that seems to be present-timed but fails to mention computers and AIDS and . . . But wait, Holly's breathlessly chatty foreword is dated 1990 but it does say the book took so long to sell (except in France; Holly *loves* the French) that the reader might take it as a historical novel.

The tale is really a detective story. Holly lives in a well-off Chicago suburb, where her father runs a lock factory and pays the bills for her uncle, who owns 52 percent of the company but is confined to a discreet nuthouse, where her feather-brained mother is bedding a local locksmith, where the local creme puts on an August "Antique Fair and Art Festival" with each year a unique

[1] My sardonic echo emphasizes that the Famlio is the Family, the Mafia, the Cosa Nostra, dope-peddlers, killers, and thieves no matter what you call them.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and attention-getting event. This year, Holly's mother, Elaine, has charge of the event. After suitable dithering, she comes up with an old, heavy, locked box with "Pandora" written on its dusty lid. She will raffle it and its unknown contents off, and as soon as the winning ticket is drawn, the locksmith will open it before the assembled crowd.

Come the day, the holder of the winning ticket and the locksmith are both dead. Holly is injured. Elaine is having hysterics. The box blew up. Now enter the cops, the intriguingly congenial criminologist Aladdin Blue, a dead uncle, Holly's own attempts at detection, and in due time a classic denouement.

It's a good tale and well told, as we expect from Wolfe. The only problem is that that "fantasy" label seems a bit forced. You may even feel that it is too forced to be fair, that your expectations are so unfulfilled that you feel either TOR or Wolfe is cheating you. If so, you have my sympathy. But it's still a good tale.

Now let's step even further afield from SF with a sample of something I haven't paid much attention to for awhile: horror. The novel at hand is **Dead Voices** by Rick Hautala. Rick seems to have grown a bit more genteel since the day I said he would geek a rat to hold your interest, but he can still be pretty revolting. Imagine this backdrop: Some time before the story, Elizabeth, Doug, and daughter Caroline (age six) are driving home through a blizzard. They go into a snowbank. Then, while father and mother struggle to get the car back on the road, a snowplow truck comes along, hurls the car into the ravine and lands on top of it. Both gas tanks explode. Caroline is incinerated. Mother winds up seeing a psychotherapist and a divorce lawyer and going home to her Maine parents. Shortly after she arrives there, someone digs up her suicide uncle's grave and takes a hand. The cemetery caretaker is found dead. The local farmer who found the body dies when his farmhouse burns. Elizabeth has nightmares, an ancient aunt takes her to see country occultists who can help her to talk to her daughter, and her new therapist displays an unhealthy interest in the occult himself.

Is the occult *really* active here? In every respect except the strange effectiveness of the Hand of Glory, Hautala leaves the question open. All the strange happenings may be no more than the interior wheel-spinnings of a stressed-out, feverish imagination. But there is that uncle's hand, converted to a five-flamed candle of mystic potency. It argues that Elizabeth is experiencing an objective, exterior reality, that her daughter's ghost really is trying to reach her with the strangely cadenced ". . . Help! . . . Mommy!", that spectral hands really do rise from the earth of Caroline's grave to seize Elizabeth's ankles, that demons really do laugh and chortle and caper upon the tombstones, that . . .

You get the idea, I'm sure. You may even enjoy the tale if you can believe at least a little in the occult, despite its inherent silliness. I cannot, and Rick did not manage to overcome that resistance in me even though his writing is sometimes quite powerful and evocative. Alas, he is not at his best with the supernatural; he is much more effective when he hews to more naturalistic lines, as in earlier books and in the more romantic scenes here. This suggests that despite his success as a horror writer, he might perform much better with a change of venue.

Pulphouse No. 8, the Summer 1990

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

science fiction issue, has a number of interesting stories, including S. P. Somtow's (Somtow P. Sucharitkul's) "Cruise Eternity," whose rich hibernators, visiting the future for a week in every century, find fulfillment of a sort in the hands of an alien collector. S. A. Stolnack's "The Last Whale" is a poetic evocation of the bitterness of being last. George Alec Effinger borrows the eye of a natural historian in "The Riddle of the Czars." And there's more, from Patricia Anthony, Nina Kiriki Hoffman, Charles de Lint, Kij Johnson, Paul Di Filippo, Thomas F. Monteleone, Jane Yolen, and others. Sixteen stories, some good, none awful, and the package, though it seems less sparkling than it did when it was new, still worth its price.

In **Across the Wounded Galaxies: Interviews with Contemporary American Science Fiction Writers,** Larry McCaffery asks questions informed by modern critical awareness to probe the work of Gregory Benford, William Burroughs, Octavia Butler, Samuel Delany, Thomas Disch, William Gibson, Ursula Le Guin, Joanna Russ, Bruce Sterling, and Gene Wolfe. The interviewees reveal themselves to be quite conscious of what they do and why they do it, and both the general reader and the academic can learn a great deal here about cyberpunk, the function in SF of sexuality, the roots of the Urth of the New Sun, and much, much more.

The biggest problem with the book may be that it prompts me to wonder whether the interviewer, many of the interviewees, and the critics have not fallen into a trap in accepting the primacy of modern critical buzzwords (postmodernism, structuralism, deconstruction, and metafiction, among others). Jargon, especially when it is undefined and counterintuitive (What does "modern" mean if not "now"? What is "postmodern"?), rings loudly of pretentious, pseudointellectual posturing. The problem is worst and most obvious in connection with cyberpunk.

From time to time, the world of modern comics taps upon my door, saying, "May I come in? Please?" My usual reply is, "Why not?" That is, a "modern comic" lands in my mailbox, I read it,[2] and then, if it seems to be science fiction or fantasy, I mention it here.

The latest arrival struck me as a rather queer item intended mostly for collectors of oddities. It was **The Magic Flute,** adapted for comics by P. Craig Russell and scripted by Patrick Mason, and yes, it was indeed a comics version of the Mozart opera[3] in which Light has stolen Dark's daughter and the Queen of Night sets Prince Tamino and scalawag Papageno on her trail. Russell, in fact, seems to be famous in certain circles for "combining [the] two seemingly disparate fields of art . . . to dramatise the operas' emotional structure."

But not their stories. If you are shaping your expectations according to your memories of the old Classic Comics renditions of great works of literature, you will be disappointed. The Classics gave you much more of the content—plot and event—than Russell does. He prefers expressing "emotional structure" through graphic postures, mysterious moods, and heavy-handed hints that, together, are supposed to clue you in to what is going on and what it all means. It probably helps if you have seen the

[2]Indeed, I can't resist reading the things, partly because they go so fast. They're popcorn for the mind.

[3]Puts a different spin on that old phrase "comic opera," doesn't it?

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

original opera. If you haven't, you won't find this version very satisfying. The comic is a supplement, not a substitute, and its best use might well be as a program booklet that would help the audience follow what is happening on stage.

The same publisher offers the first issue of **Orbit Graphic Science Fiction,** subtitled "The Best of Isaac Asimov's Science Fiction Magazine." It contains comics versions of Asimov's own "Nothing for Nothing," in which alien explorers discover the marvels of Paleolithic art; Frederik Pohl's "Fermi and Frost," which clearly and movingly demonstrates the horrors of nuclear winter; and Neal Barrett, Jr.'s "Ginny Sweethips' Flying Circus," which engages our prurient interests as it considers how people will survive after the war. All strike me as working rather better than the opera did, although not as well as their originals. I suspect that Davis Publications agrees, for the magazine ends with an ad that reads in part: "Make the leap . . . from the pages of *Orbit* . . . to the pages of . . ."

The second issue will offer "graphic adaptations" of Asimov's "Marooned off Vesta," Ben Bova's "Silent Night," and Lawrence Watt-Evans' "Windwagon Smith and the Martians."

BOOKS ON DISK

The third (Fall 1990) issue of *ShareDebate International* is now available, and it seems to be improving as others join the "debate" aspect of this on-disk magazine. This issue has comments by economics Nobelist Milton Friedman on the National-interest (now Future-interest) Project-level Stock market idea; he says it amounts to "trying . . . to make a cat bark." There are also a reprint of a Friedman article and proposals for two new debate topics, on electronic publishing (with an excerpt from Ben Bova's *Cyberbooks* as the opening shot) and on the need to put moral values back in education. Interesting stuff for $5 an issue or $25 a year (four issues) from Applied Foresight, Inc., P. O. Box 20607, Bloomington, MN 55420.

John Galuszka (Serendipity Systems, P. O. Box 140, San Simeon, CA 93452) is now operating Bookware, a distribution system for on-disk books disktop published by their authors. As a sample, he sent me **Software** ($4), a novel by James J. Franxman which the catalog describes like so: "A scientist in Dallas discovers a specific voltage at which certain plastics can conduct electricity. A medical researcher in Cambridge . . . discovers a frequency at which binary computer code can be transmitted directly to the brain stem of Rhesus monkeys. Put these two breakthroughs together and you have a new computer program . . . that moves computer software from user-friendly to user-deadly . . ." If that sounds unlikely, well, I've seen worse premises turned into entertaining stories. Alas, the author takes forever to give any hint of what is going on, and the dialog is along the maid-and-butler lines of:

Mo: The company is in Cambridge, Massachusetts.

Shmo: As you know, that's a little west of Boston.

I'm not kidding. It will be a while before disk-top publishing overcomes the very basic problem that most of what gets disk-topped has been rejected by more conventional publishers (and only sometimes because it isn't conventional enough). That is, it needs a mechanism for selection and quality control, what on-paper publishing calls an editor. But watch this space. I'll let you know if

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

and when disk-topping finds its Stanley Schmidt, as well as when the occasional diamond shows up (it has to happen, right?). In the meantime, bear in mind that you can recycle a disk.

ANADEMS

It's horn-blowing time again. Ian Randal Strock, this magazine's assistant editor, has a piece coming up in *The Sterling Web* (Arachnid Publishing, P. O. Box 38190, Tallahassee, FL 32315; $4.75 + .75 postage and handling for one issue; $18 for a four-issue subscription). The magazine, which bills itself as "Science Fiction/Dark Fantasy," has looked better with every one of its five issues (as of Summer 1990) and is now a nice example of a small-press semi-professional magazine. Contributors be warned: So far, it pays only in copies.

Michael Flynn contributed to his reputation as an *Analog* favorite with a series of stories concerning the Babbage Society, a group which formed when several people realized that the Babbage machine, the first (and mechanical) computer, made it possible to calculate, predict, and hence control the future. Since the Society splintered over issues of means and ends, its eventual discovery by outsiders set the stage for even more excitement than you saw in these pages. If you want the rest, get **In the Country of the Blind** from Baen Books. It's $3.95 for 527 pp., and length alone makes it a good buy.

Finally, Ace Books has just bought two more novels from me. **Honeysuckle Wine** (which will be out this fall) and **Woodsman, Woodsman (Spare that Tree)** are both set in the same "organic future" as *Sparrowhawk* (though some years later). And that's all I'll say. ■

●The arts are called liberal because they enable those who practice them to live in freedom.

Tirso de Molina

●Life, too, is an epidemic, sons catching it from fathers, daughters from mothers.

Jacques Prevert

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

brass tacks

Dear Dr. Schmidt,

The second thing I do when *Analog* arrives in my home, is go through it looking for a piece that appears to be humor-oriented (intentionally). . . . The first thing I do is carefully examine the cover art.

Usually the cover art is good. And usually there are no humor pieces. So then I sigh, and within a few days I read the thing cover to cover. Or attempt to. High–tech–rescue–in–the–void stuff doesn't hold me. I've read some that make me wonder why the authors even bothered to put humans—people—in at all.

I read one, and you probably recall the title and author, I don't, about "sail" repair. This was about as enjoyable as saving buttons or mending a loose hem. Yawn.

But the humor pieces—invariably they're pretty good. Now that I think about it, the percent of humor stories that are good outshines the percent of good non-humor. Why? Do people shy from writing humor and sending it in? Are editors (ahem) more critical when it comes to *how* funny the stories are?

The third thing I do with *Analog* is read the table of contents, looking for, primarily, women writers.

Conclusion: I'm very pleased when humorous writing is published in *Analog*. When it isn't for month after month, I wonder about my subscription . . . why bother if it doesn't give me what I like?

How about one in twelve or so issues with all women writers? Even solicit for them?

If you're bothered by readers who negatively critique your humor pieces as "sophomoric," just stuff them in a "section": *Sophomoric Humor*.

SHARON PHILLIPS

Coarsegold, CA

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

I like humor, too, and ideally I'd like to have at least one funny story in every issue. Unfortunately, they aren't that easy to find. Relatively few writers even attempt humor; still fewer succeed. Most of us find it one of the most difficult kinds of writing, which could help explain both observations.

We also get relatively few submissions from women, and until recently a high percentage of those were types of stories that didn't fit into Analog's *format, like elf-and-dragon fantasies. Recently, as I hope you've noticed, there's been a significant change in that—a good many women have turned up producing consistently high-quality,* Analog*-type SF (Lois McMaster Bujold, Amy Bechtel, Elizabeth Moon, and Maya Kaathryn Bohnhoff, to name just a few). I hope and believe that's the beginning of a trend, but I don't think it would be right to actively solicit stories by women* per se, *or to segregate them in "special" issues. The author's gender has never been any sort of consideration in our selection of stories, and I don't think it should be. And special issues seem to many of us to convey the highly sexist message that good stories by women are an oddity that needs to be pointed out as such, and I don't believe that's true.*

Dear Mr. Schmidt,

Having just read your editorial in the September 1990 issue of *Analog*, I feel compelled to respond.

First, let me say that I agree wholeheartedly that humor and a sense of humor are absolutely essential to a sane and healthy society. My parents enabled me to have self-esteem in that they taught me to make jokes about myself in serious situations and to see the humorous side of every experience.

Please note the comment about making jokes "about myself." I fear that your editorial was incomplete. Your own example was of a physicist making fun of physicists. A joke at the expense of others can only be perceived as pure humor when the jokester is included in the joke. Unfortunately, too often "jokes" are used to put others down and then defended by saying the butt of the joke "has no sense of humor." Yes, there is humor in the Black American experience, and it is up to Black Americans to make those jokes. There is humor in the Jewish American life, and it is up to Jewish Americans to reveal that humor. We humans must make jokes about our own lives. If there is a butt of the joke, the teller must be part of that butt. We Americans can make jokes about Americans because we are Americans. We don't like it when non-Americans make jokes about us. We humans must consider our immediate situation before we tell our jokes. Only among extremely intimate, well-known friends/family can we tell jokes where we are not the butt. And even then they sometimes wonder about our true feelings.

Thank you for the opportunity to add to your opinion.

TERESA M. ASH-BUBERT

Wichita, KS

Dear Stan;

Your September editorial, "Sensory Deprivation," seems to skirt the real issue, and ignores the reason *why* humor with a racial or ethnic basis raises hackles. Your arguments as to the benefits of humor are valid (so far as I can tell) and I have no quarrel with them. However, they completely sidestep the reason that people have become sensitized to such "jokes."

The reason is the simple fact that there are people who will use humor to

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

poke fun at, or otherwise denigrate other people, particularly people in racial, ethnic, etc. groups other than their own. True, such people use other methods as well, but the particular use of humor for this purpose always leaves the attacker with the defense: "Well, I was only joking," whether or not he (or she: let me not be accused of male chauvinism) was actually doing anything of the sort. Thus the butt of the "joke" cannot defend himself without taking the chance of falsely accusing his attacker (if, indeed, the "joke" was legit). Thus by couching his derogatory or prejudicial statements as a "joke," he accomplishes the dual task of getting his message across while robbing his victim of a defense. In the absence of being able to read minds, one can never be sure what the motives of the "joker" are, hence the sensitivity to the "joke."

I dare say that you did not address this point in your editorial. Defending humor is admirable, but I, at least, can see no defense for the practice of attacking anyone (either individually or as a group) while using humor as a disguise.

Finally, lest I be accused of being one of the "humorless scientists" who considers humor "beneath an august periodical's dignity" may I refer you to the extensive series of articles titled "Statistics in Spectroscopy" in the journal *Spectroscopy* (Aster Press, Eugene, Oregon) which started in January 1986 and is still going strong (a collection of these articles will be published by Academic Press early in 1991), or to the 14th literature citation in the paper: "Effect of Repack on Calibrations Produced for Near-Infrared Reflectance Analysis," *Analytical Chemistry*, Vol. 58, p.1454 (1986). Both of these journals are highly respected scientific journals of the first caliber; these examples should prove that neither the journals involved, nor their authors (at least this author) consider themselves above including humor in scientific articles.

Sincerely,

DR. HOWARD MARK

Suffern, NY

I don't admire or encourage using humor in the ways you describe—but I do see potential dangers in trying to prohibit people from doing so. I have also seen many cases of people reading such offense into things where it was neither intended nor implied, and a bit of desensitization there would seem to be to everybody's advantage.

Sir:

As a dedicated science fiction fan for the past 25 years I know that many of the authors have a minimal understanding of the science they use in their stories. This does not reduce my enjoyment of their works unless a blatant error is central to the story idea. Such is the case with "Only the Weatherman" by Doug Larsen in your September 1990 issue.

In order to operate some 200 solar collectors in reverse the story resorts to heat pumps. The difficulty is, where does the energy to operate the pumps come from? For every calorie pumped from 300K (ambient) to 600K (radiator) another calorie of high quality energy (i.e., electricity) must be provided. If the energy source is less than 50% efficient, the net result is more heat, not less. Note that the best electrical power plants operate at about 38% efficiency. This contradicts the story's major premise, that pumping heat to space would result in cooling and therefore rain.

Please note that I do not object to unlikely or impossible premises when they are presented appropriately. Your story "Outlaw" by W.R. Thompson in

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

the same issue has several outrageous premises (FTL of course, and 4K life for starters) which are fine with me. There is a difference between the fantastic and the outright mistake.

In "Outlaw" the ideas are presented via "it's a long way away" and "science of the future / aliens is magic," both of which are traditional literary devices. "Weatherman" is not just mistaken, it also uses a logical (though specious) argument about the 4th power law of radiation to justify its point. This is in the realm of hard science, and the outcome should also be plausible in terms of hard science. Unfortunately, the hardest of sciences is thermodynamics, which in this case says "It isn't so, folks!"

I mention this in the hope that *Analog* will continue its fine tradition of "hard" science fiction and publish stories with wonderful, implausible, but not totally mistaken ideas.

May your Entropy remain low,

HARA RA

San Diego, CA

The author replies . . .

You're right that a system such as the one described in "Only the Weatherman" would require considerable energy. And your guidelines for what is reasonable expectation for suspension of disbelief closely parallel my own.

Your mistake comes in the assumption that the power for the weather system must be right at hand. In actual fact, the source of electricity for a town like Harlowton is often quite remote. Harlowton, Montana, on which my fictional Harlowton is based, receives electrical power from either Great Falls or Billings—each around 100 miles distant. Any additional heat generated by those power plants to run the weather system would have little direct impact on the local environment that Joan and Jim are trying to affect.

In addition, when I envision weather systems such as the one described in the story, I ideally picture the required power to be supplied by hydroelectric plants, which produce less heat than plants operating on fossil fuels. This is not unreasonable, since Montana has several hydroelectric power plants. One that springs to mind is the Hungry Horse hydroelectric power station, about 300 miles from Harlowton.

The use of the Fourth Power law of radiation would be specious only if Joan and Jim, while designing their system, weren't interested in determining the intensity at which it could operate. Obviously, they would have to be interested, because how could they predict the system's effectiveness if they didn't factor in its intensity capability?

DOUG LARSEN

Dear Dr. Schmidt,

This fall, we are taking a course titled "Water Resources" as undergraduate students. As part of the study of water budgets, we have been examining the causes and results of precipitation. Earlier this month, there was a story by Doug Larsen, "Only the Weatherman," that dealt with the greenhouse effect and precipitation. When the course instructor, Dr. Mylroie, read the story it seemed to him that the story had a flaw. He assigned the story as an outside reading for the class, and asked us to comment on the story, taking into account what we had learned to date in the course about precipitation. A majority of the class also picked up on the flaw as well. We have decided to write you and comment on the story for *Brass Tacks*.

The author has left the reader with the impression that the solar collectors

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

are intended to pass primarily 8 to 12.5 micron wavelengths to space. The author probably intended to pass some energy directly to space, but have enough on other wavelengths to produce the desired atmospheric heating that would lead to thermal convection and a low pressure cell. The average reader, taking our class as an example, fails to see it that way. We saw the solar collectors as modified so as to emit radiation (8–12.5 micron range) that will pass through the atmosphere without absorption. The author is therefore viewed as working at cross purposes. He wants to rid the Earth of excess heat by passing it off to space, and he also wants to create a low pressure cell by heating the air to produce convection. He *appears* to be trying to heat the atmosphere by using the 8 to 12.5 micron band. By radiating the heat from 207 solar collectors directly to space, the author has actually created a cold spot on the Earth's surface. The troposphere is heated primarily by re-radiation of energy such as infrared radiation from the ground, which is why the atmosphere cools with increasing altitude. The solar collectors are actually masking this average re-radiation energy by passing it directly to space, which will create denser air and a downward flow of air, or a high pressure cell, the opposite of what is desired.

The implications of the story are important. If what was stated actually worked, people would try to focus their waste heat on the atmosphere to generate local convection and produce rain (which does occur today over large, black asphalt parking lots). If we assume their interest is in rain, they will be more concerned about heating their local area of atmosphere, and not be so concerned about dumping heat to space. The net result is elevated planetary temperatures as our waste heat is efficiently focused on the atmosphere.

WATER RESOURCES CLASS,
MISSISSIPPI STATE UNIVERSITY
Mississippi State, MS

The author replies . . .

It's quite a thrill to hear that my story has been assigned reading to a college class, even if it is in the terms of identifying the flaw.

It was probably misleading for me to keep referring to a low pressure system, because in the accepted sense of the term, as you pointed out, that's not what it is. Rather, Joan and Jim were generating a partial vacuum, and this is a departure from textbook meteorology.

Here's my thinking. This is an unusual device—one that artificially pumps the heat out of a relatively small volume. The air in the volume is cooled and, therefore, contracts. This causes more air to be drawn in to fill the partial vacuum. This new air is in turn cooled, which makes it contract, which draws in more air, and with prevailing westerly winds, this replacement air would preferentially be drawn from the west. The amount of moisture in the air is not changed, but the ability of the cooler air to hold that moisture is reduced. The end result must be precipitation. And that supplies the nudge that Joan and Jim were talking about on page 157 of the story.

Thank you for your detailed response, and I hope the above comments encourage you to think in terms of controlling the atmosphere rather than merely observing it.

DOUG LARSEN ■

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

Classified Marketplace

AN JUNE/91

ANALOG/ISAAC ASIMOV combination CLASSIFIED AD rate is $6.50 per word—payable in advance—($97.50 minimum). Capitalized words 40¢ per word additional. To be included in the next issue please send order and remittance to I. M. Bozoki, Classified Ad Director, DAVIS PUBLICATIONS, INC., 380 Lexington Ave., New York, N.Y. 10017.

ART

Unique Flights of Imagination

Best original fantasy, horror & science fiction artworks.

Worlds of Wonder

Video Gallery Catalog VHS cassette $20. ppd.

3421 M St N.W. Suite 327-V
Washington, D.C. 20007 (202) 298-7889

AUTHOR'S SERVICES

COPYRIGHT YOUR STORIES, articles, or songs. No Attorney needed! Complete kit (including 1991 changes) with Instructions and Forms. $15.00: COPYRIGHT, 716 S. Philadelphia Blvd., Aberdeen, Maryland 21001.

BOOKS & PERIODICALS

100,000 science fiction and mystery paperbacks, magazines, hardcovers. Free catalogs! Pandora's, Box Z-54, Neche, ND 58265.

FREE CATALOGS of Science Fiction pulps, digests, paperbacks, hardcovers. Collections also purchased. Bowman, Box 167, Carmel, IN 46032.

CATALOGS & DIRECTORIES

IF You Like Dragons, Wizards, and Fairies; send for our catalogue: The Silver Dragon, 5600 Post Road, East Greenwich, RI 02818. Dept. A.

DRAGON CATALOGS

FANTASTIC variety of decorative, useful, and wearable dragon items. Full-color catalog $2.00. Dancing Dragon - ANO, 5670 West End #4, Arcata, CA 95521.

PERSONAL

FANTASY EXCHANGE. Underground, uninhibited nationwide dating-correspondence. Free membership! All welcome! Information: $2.00, SASE. Exchange, 243 Midtown Plaza, Suite 287, Rochester, NY 14604.

RECIPES

PAULA'S Penny Powwow's Best Collection. Send $3.50 & Sase to: P.O. Box 927, Avondale, PA 19311.

START YOUR OWN BUSINESS

MOVE AHEAD! 10 books in 1! How to start and operate your own profitable business at home. Act Now! Send for free details. Ike Company, Business Information Systems, 1541 West Market Street, Pottsville, PA 17901.

TAPES & CASSETTES

OLDTIME RADIO PROGRAMS. Great Science Fiction! Also, mysteries, comedies, westerns. Free catalogue. Carl D. Froelich, Heritage Farm, New Freedom, Pennsylvania 17349.

In The Future. . .

YOUR

Classified/Display

AD
CAN BE
PLACED HERE

For details:
SF CLASSIFIED
380 Lexington Ave.
New York, NY 10017
(212) 856-6338

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

a calendar of analog upcoming events

24-27 May
DISCLAVE (Washington, D.C. area SF conference) at Hotel Sheraton Greenbelt, New Carrollton, Md. Guests of Honor—Lewis Shiner and Alicia Austin. Registration—$25 until 30 April, $30 at the door. Infor: John T. Sapienza, Jr., Box 677, Washington DC 20044-0677.

31 May-2 June
THUNDERCON 1 (Trek/Media/SF conference) at Central Plaza Hotel, Oklahoma City, Okla. Guests: Colm Meany, Russell Bates. Registration—$15 by 1 May, $18 at the door ($8/day). Info: ThunderCon 1, 2019 Beaumont, Norman OK 73071. (405) 329-0835.

21-23 June
Fourth Street Fantasy Convention (Minnesota fantasy-orientation conference) at Sheraton Park Place Hotel, Minneapolis, Minn. Guest of Honor—Diana Wynne Jones. Registration—$22 until 1 June, $35 at the door. Info: Fourth Street Fantasy Convention, 4242 Minnehaha Avenue South, Minneapolis MN 55406.

21-23 June
New Orleans Science Fiction and Fantasy Festival at Clarion Hotel, New Orleans, La. Guest of Honor—Frederik Pohl, TM—Pat Cadigan, Fan Guest of Honor—John Slade. Registration—$20 until 26 May; $25 at the door. Info: The New Orleans Science Fiction and Fantasy Festival, Box 791089, New Orleans LA 70179-1089. (504) 835-4314.

4-7 July
WESTERCON 44/V-CON 19 (West coast SF conference) at Gage Residence, University of British Columbia, Vancouver, B.C. Guest of Honour—William Gibson, Artist Guest of Honour—Warren Oddison, Fan Guests of Honour—Jerry Kaufman and Suzanne Tompkins. Registration—C$45 (US$40) until 31 May; C$57 (US$50) at the door. Info: Westercon 44/V-Con 19, Box 48478, Bentall Centre, Vancouver BC V7X 1A2 CANADA.

5-7 July
CONGREGATE 2 (Cambridge-area SF conference) at The Moat House Hotel, Peterborough. Theme: Heroes. Registration—£16 attending, £8 supporting. Info: Chris Ayres, Congregate 2, 118 Cobden Avenue, Peterborough, Cambs. UK.

29 August-2 September
CHICON V (49th World Science Fiction Convention) at Hyatt Regency, Chicago, Ill. Guest of Honor—Hal Clement; Artist Guest of Honor—Richard Powers; Editor Guest of Honor—Martin H. Greenberg; Fan Guests of Honor—Jon & Joni Stopa. Registration—$125 until 15 June 1991. Supporting—$30 through 15 July 1991; not available thereafter. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Chicon V, Box 218121, Upper Arlington OH 43221-8121.

8-14 September
VOLGA-CON (International SF convention on the Volga). Sponsored by SF Club "The Winds of Time" and the Youth Association ATOM. Info: Volga-con, % Boris A. Zavgorodny, Volgograd-66, Poste restante, 400066 U.S.S.R. Telephones: 34-74-62, 34-74-64, 34-44-09, 34-86-56.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

TAKE ANY 5 BOOKS FOR $1 with membership

SEE OTHER SIDE FOR ADDITIONAL SELECTIONS.

4424 *Swords Against Wizardry, The Swords of Lankhmar, Swords and Ice Magic*
$12.98x

6635 *The Darkangel, A Gathering of Gargoyles, The Pearl of the Soul of the World*
$44.85●/**$12.98**

7443 **$9.98x**

4978 $18.95/**$8.98**

5769 **$6.98x**

7468 Nonfiction
$22.50/**$9.98**

HERE'S WHAT YOU GET WHEN YOUR MEMBERSHIP'S ACCEPTED . . .

A GUARANTEE OF SATISFACTION. If you're not 100% satisfied with your books, return them within 10 days *at our expense* and owe nothing.

HUGE DISCOUNTS ON HARDCOVER BOOKS. Save as much as 65% off publishers' edition prices. Club books are sometimes altered in size to fit special presses.

THE FREE CLUB MAGAZINE. You'll receive up to 16 issues a year. Each issue reviews 2 Featured Book Selections plus a wide variety of alternate books from the Club's extensive library.

SHOPPING MADE SIMPLE. To get the Featured Book Selections, *do nothing*—they'll be sent automatically. If you prefer another book—or none at all—simply return your Member Reply Form by the date shown. A shipping and handling charge is added to each order.

AN EASY-TO-MEET OBLIGATION. Take up to 1 year to buy 4 more books at regular low Club prices. Afterwards, you may resign membership anytime.

RISK-FREE RETURN PRIVILEGES. If you get an unwanted book because your Club magazine was delayed and you had less than 10 days to respond, simply return the book *at our expense.*

THE Science Fiction BOOK CLUB®

MAIL TO: *The Science Fiction Book Club*
6550 East 30th Street, P.O. Box 6367
Indianapolis, IN 46206-6367

Please write book numbers here:

YES! Please enroll me in *The Science Fiction Book Club* according to the risk-free membership plan described in this ad. Send me the 5 BOOKS I've indicated. Bill me just $1, plus shipping and handling.

SAVE MORE—BUY YOUR FIRST BOOK NOW FOR $2.98
☐ Send me the book I've indicated and reduce my commitment to only 3 more books. Bill me just $2.98, plus shipping and handling.

(write book number)

18313 48

Mr./Mrs.
Miss/Ms. _____
please print

Address _____ Apt. _____

City _____ State _____ Zip _____

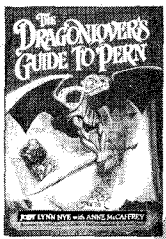
18314 38

If you're under 18, your parent must sign here _____

Members accepted in U.S.A. and Canada only. Canadian members serviced from Canada, where offer is slightly different. Sales tax added where applicable. We reserve the right to reject any application. ANA 6/91

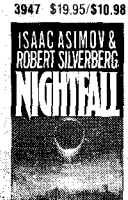
LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

BE. DREAMS. BEYOND REALITY.

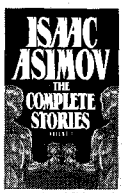


3947 $19.95/**$10.98**

4796 $24.95/**$12.98**



4778 $19.95/**$10.98**

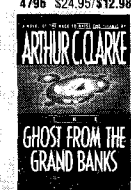


5785 $22.95/**$11.98**

0125 $19.95/**$6.98**

5777 **$6.98x**

6676 $19.95/**$9.98**



4846 $19.95/**$9.98**

4828 $19.95/**$9.98**

6650 $18.95/**$9.98**

*7401 $18.95/**$6.98**

7435 $19.95/**$10.98**

0208* $18.95/**$8.98**

7419 $19.95/**$9.98**

1420 The First, Second and Third Books

$9.98x

7260 *Woundhealer's Story, Sightblinder's Story, Stonecutter's Story*

$45.85●/**$8.98**

4747 *So You Want to Be a Wizard, Deep Wizardry, High Wizardry*

$45.85●/**$12.98**

0752 *Elric of Melnibone, The Sailor on the Seas of Fate, The Weird of the White Wolf*

$6.98x

1172 *The Vanishing Tower, The Bane of the Black Sword, Stormbringer*

$8.98x

7484 $19.95/**$9.98**

TAKE ANY 5 BOOKS FOR $1 *with membership*

Prices in fine print are publishers' hardcover editions.
Prices in bold print are Club hardcover editions.

- ● Combined publishers' editions
- x Hardcover edition exclusively for Club members
- * Explicit scenes and/or language
- + Copyright © 1990 Paramount Pictures. All Rights Reserved.

THE Science Fiction BOOK CLUB®
Reading That's Worlds Apart

Use the coupon on the other side to tell us which 5 books you want now!

LICENSED TO UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED